JUNE 15, 1961

AUTOMOTIVE INDUSTRIES

ENGINEERING · MANAGEMENT · PRODUCTION · DESIGN

A CHILTON PUBLICATION

Architects of the Automotive Future

EXCLUSIVE: **Report of AUTOMOTIVE PANEL CONFERENCE of Detroit, I.D.I. . . Page 3**

MINIATURE GRINDING...

With A New Problem-Solving Internal

by Stuart St. John
Assistant Sales Manager
The Heald Machine Company

Seldom does any new machine represent all the answers to the desires of production people. But the new Model 090A and 0901A miniature internal grinding machines come mighty close. In fact, these new machines constitute a major break-through in the ability to control variables inherent to miniature internal grinding. This, in addition to substantially faster machine cycles, was made possible through a complete analysis of all miniature grinding techniques. Based on the findings of our research and development engineers, this machine was designed, produced and has proved its capabilities most convincingly. Here are some of these developments which have been incorporated in the new design and which have placed these machines well ahead of their time by present-day standards.

NEW models provide simpler, more reliable and infinitely adjustable wheel-wear compensation from 0 to .001 resulting in substantially longer wheel life.

NEW, lighter-weight vibration-damped cross slide on anti-friction ways gives concise and consistent repeatability.

SIMPLER, more efficient control and equipment arrangement permits easy service inspection through hinged doors at rear. No access necessary from either end.

NEW models feature a 75% reduction in hydraulic and electrical control equipment, simplified circuitry and ⅓ smaller electrical cabinet.

NEW feeding method gives greatly improved control of size and taper, increases accuracy by as much as 50%.

NEW direct-reading micrometer dials permit cross slide to be precisely positioned without use of dial indicators.

NEW cross slide resets automatically for wheel change; at press of button, machine automatically dresses wheel and re-enters cycle with resultant saving of operator time

NEW direct-reading digital dial shows operator the amount of wheel life remaining at all times.

NEW, simpler, 3-piece guarding retains all coolant yet opens easily to expose complete machine.

These and other improvements make the 090A and 0901A miniature internals that challenge *any other machines* intended for this class of work. Your Heald engineer will be glad to arrange a demonstration for you.

Heald Model 090A precision internal, designed specifically for grinding miniature bores. Smallness of bore is limited only by the availability of small diameter wheels.

It PAYS to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.
WORCESTER 6, MASSACHUSETTS

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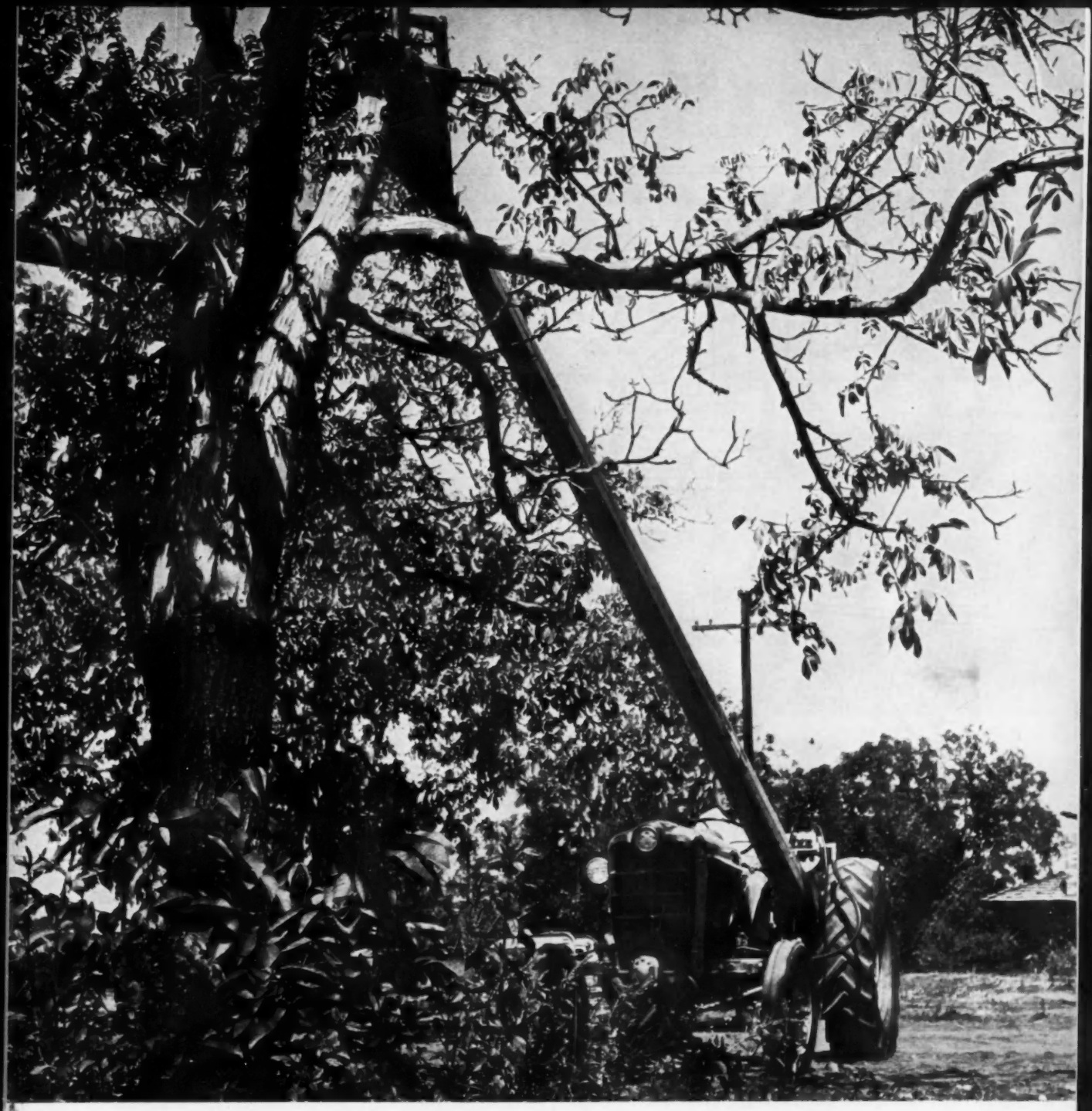

It takes arms of sheet steel for this fruit-tree shakedown

They don't pick fruits and nuts nowadays. Instead, a sturdy tractor-mounted boom reaches up, clasps an 8-inch limb in a cushioned grip, and shakes down every walnut, plum, or cherry.

It's a job made to order for strong, lightweight sheet steel. This hydraulic boom, made by Gould Bros., Inc., San Jose, California, is made from 10-ga sheets of Bethlehem's Mayari R high-strength, low-alloy steel. Because of its high yield point, Mayari R sheet steel reduces deadweight while maintaining strength and impact resistance in the boom.

Whatever your product, it makes sense to design and work with sheet steel. Bethlehem can furnish the sheets you need for the job, in a wide variety of gages, tempers, and surface finishes. Let's talk it over soon. Our nearest sales office will give you prompt assistance.

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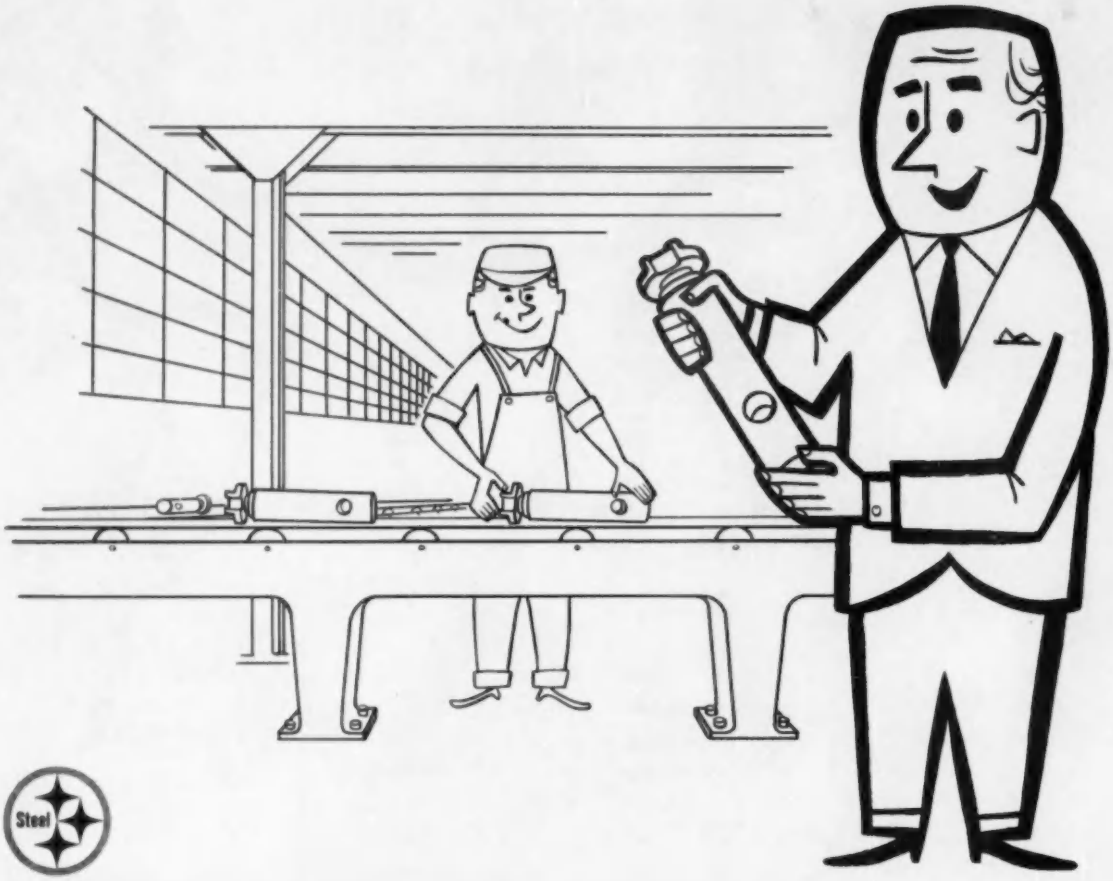

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A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

JUNE 15, 1961

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories • Production and Processing Equipment • Design • Production • Engineering • Management

VOL. 124 No. 12

Architects of the Automotive Future

CHARLES JORDAN chief designer, Cadillac Studio, GM Styling (top left)

RICHARD TEAGUE asst. dir., Automotive styling, American Motors (center)

KENNETH A. HOPKINS Detroit Chapter Chrmn., Industrial Designers Inst. (right)

JOHN NAJJAR executive stylist, Advanced Styling, Ford (bottom left)

ARTHUR TARABUSI designer for Automotive and Industrial Divisions, Great Lakes Region, Reynolds Metals Co. (bottom right)

A digest of 10 tasks of the automotive industrial designer gives details of how typical top designers are solving vehicular improvement problems to meet the challenge of better mobility in transportation.

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OTHER FEATURES . . .

NEW SHAPES, NEW FORMS IN STEEL

The creative imagination of America's engineers and designers is giving impetus to the emergence of an exciting new world. Some of the ideas of tomorrow in design and engineering are presented. Page 68

FORD STYLING DESIGNS A TRACTOR

In developing a styling theme for its "6000" Diesel-powered tractor, announced several months ago, the Tractor and Implement Division, Ford Motor Co., called upon the talents of its Styling Office. Page 70

DOOR LOCK TESTS AT FORD

Special equipment is used at Ford's Sandusky, Ohio, plant to test luggage compartment and door locks. Page 79

PISTON SURVEY

Many of the pistons in use today are described and illustrated in a seven-page article. Page 80

INSPECTION AND QUALITY CONTROL

Quality control in modern plants no longer depends upon final inspection. Page 81

18 NEW PRODUCT ITEMS AND OTHER FEATURES, SUCH AS:

News of the Machinery Industry; Industrial Statistics; and News of the Automotive and Aviation Industry.

. . . continued on next page

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SBME Society of Business Magazine Editors

BPA Business Publications Audit of Circulation

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES, Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39, Second Class Postage Paid at Philadelphia, Pa. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, $2.00 per year; $3.00 for 2 years. All Others, $10.00 per year. Single copies, 75¢. Statistical Issue and Products Guide Issue, $2.00 each, net. National Auto Show Issue, $1.50 per copy, net.

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ADIPRENE polymers are members of Du Pont's new urethane rubber family. These urethane polymers can be compounded in a wide range of hardnesses and retain their elastomeric properties throughout this range. They combine the resilience of rubber with the hardness and load-carrying capacity normally associated with many metals and hard plastics. To engineers, they provide a new class of materials and a new approach to automotive design problems.

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Hardness, Shore D	43	50	60	78
Modulus, 300%, psi	2100	3200	7000	—
*Tensile Strength at Break, psi	7000	8825	8500	8500
Elongation at Break, %	450	480	340	250
Izod Impact Notched ft.-lbs./in.	Flexed	Flexed	>20	1.2
Split Tear, ASTM-D 470 lbs./linear inch	50	155	160	200
**Compression/Deflection, psi @ 5% defl.	575	750	1800	6000
Rebound Resilience, %	45	40	42	45
Oil Resistance	Excellent	Excellent	Excellent	Excellent
Low Temperature Brittle Point, °F.	<-80	<-80	<-80	<-80

*Samples pulled @ 1 in./minute (elastomer stocks normally pulled @ 20 in./min.)
**Shape Factor—1.0

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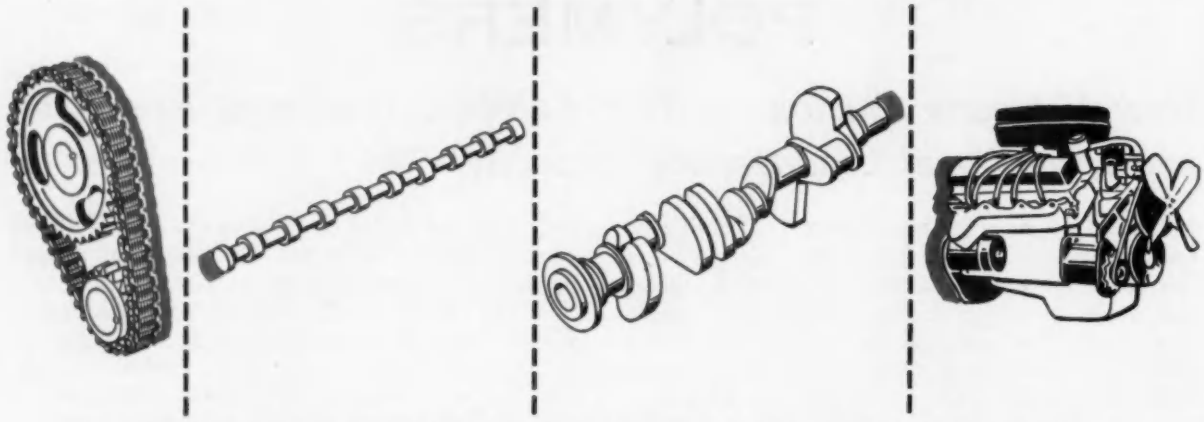
a cost-shaking "chain reaction"



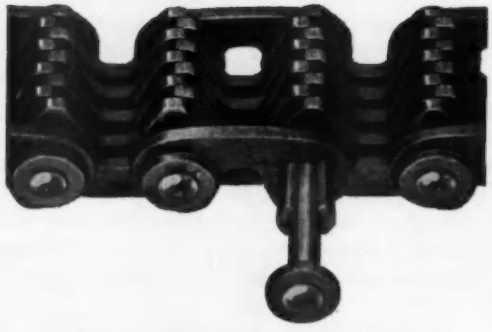
Narrow chain and sprockets = Shorter camshaft + Shorter crankshaft + Shorter engine length

narrow timing chain puts savings in the millions

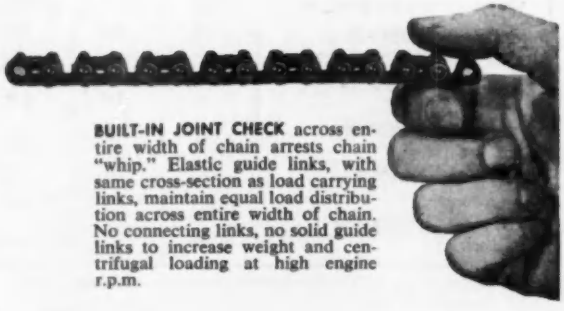
Automobile engine designs that begin with Link-Belt's *narrow* timing chain lead to appreciable savings: shorter camshaft, shorter crankshaft, narrower face sprockets, shorter overall engine length. Total savings? Millions of dollars for the manufacturers who use it!

This durable chain closely maintains factory-set timing during thousands of miles of car operation. Segmental bushings automatically provide snug joints, reduce "slap," resulting in longer and quieter chain life.

Ask us about how this chain has accommodated a more-than-100% increase in engine horsepower. Let us show you why Link-Belt timing chains are standard with three of the four major automotive manufacturers. Write for Book 2065 for complete specification data. 15,302



LONG-LIFE DESIGN with round pins free to rotate—not tied together with extra links—distributes wear evenly over entire surface of pins. Segmental bowed bushings maintain snug joints, assure thousands of miles of quiet, accurate timing.



BUILT-IN JOINT CHECK across entire width of chain arrests chain "whip." Elastic guide links, with same cross-section as load carrying links, maintain equal load distribution across entire width of chain. No connecting links, no solid guide links to increase weight and centrifugal loading at high engine r.p.m.

LINK-BELT

TIMING CHAINS AND SPROCKETS

LINK-BELT COMPANY: 220 S. Belmont Ave., Indianapolis 6, Ind.

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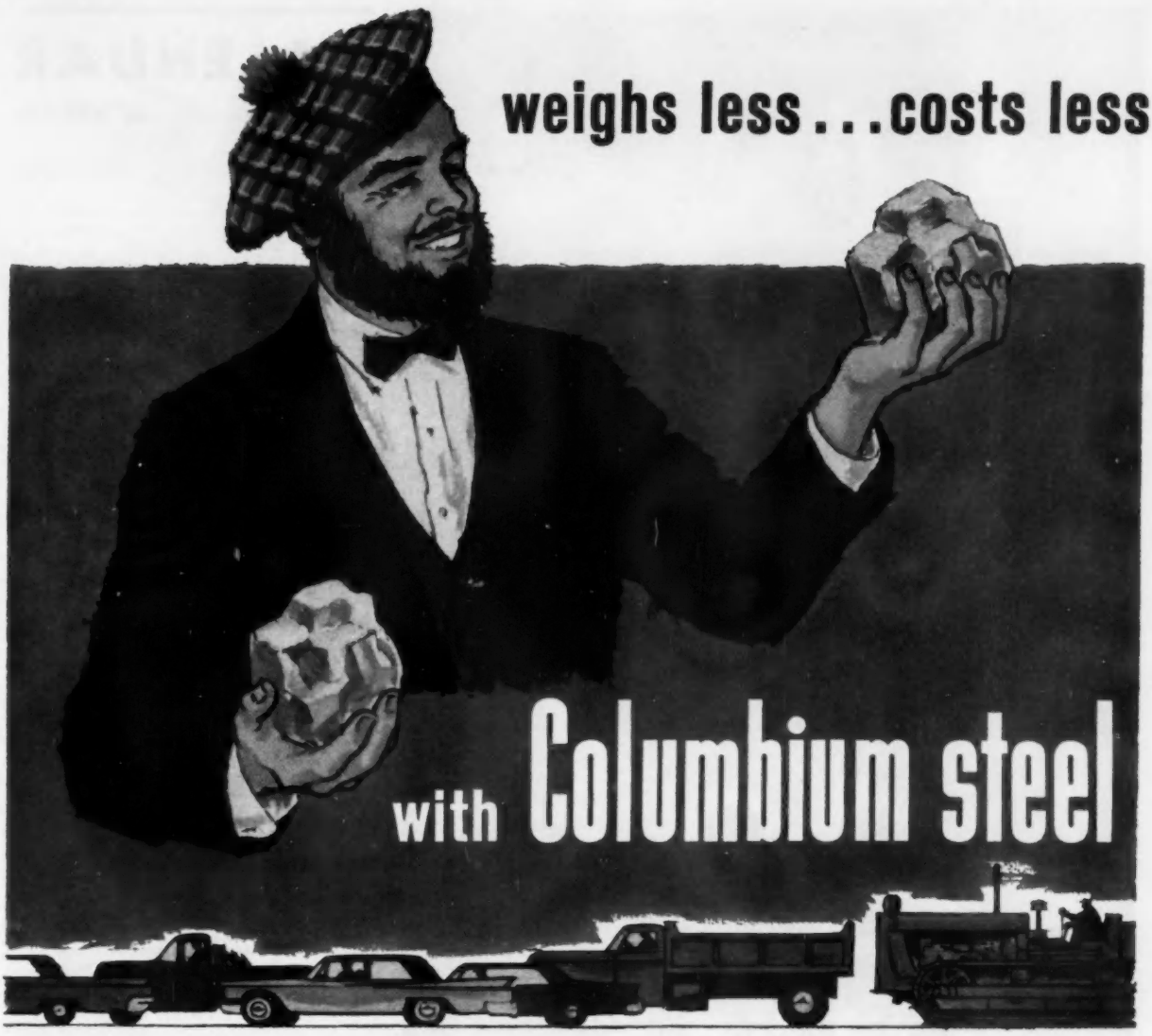
weighs less...costs less



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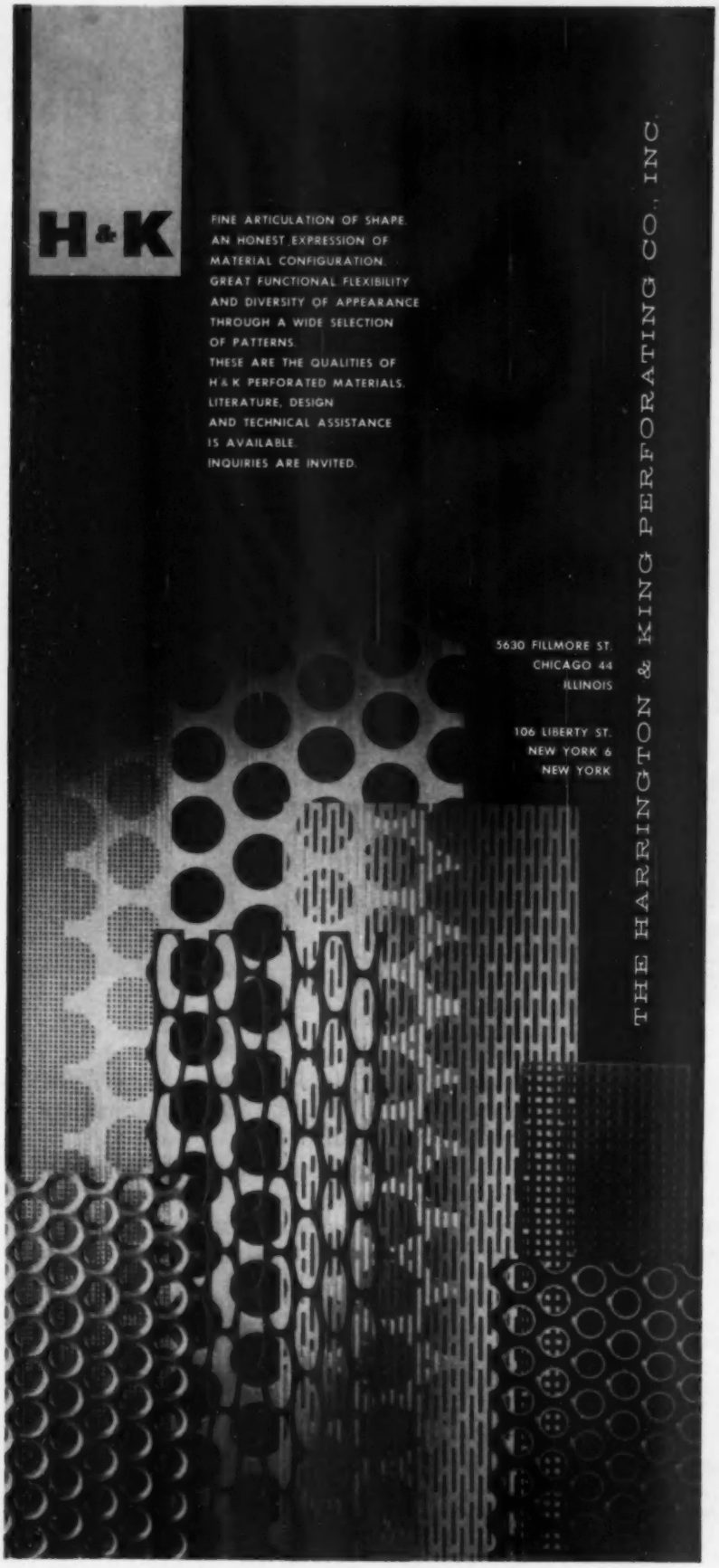

CALENDAR

OF COMING SHOWS AND MEETINGS

Material Handling Institute, Great Lakes Show, Detroit .....June 19-21

Massachusetts Institute of Technology, Scientific and Engineering Reports, Cambridge, Mass...June 19-23

American Society for Testing Materials, Annual Meeting, Atlantic City, N. J. .....June 25-30

American Vacuum Society, 5th Annual Conference on Vacuum Metallurgy, Heights Campus, New York U. .....June 26-27

American Institute of Electrical Engineers, Aerospace Technical Conference, Philadelphia ....June 26-30

1st International Truck, Trailer and Equipment Show, California Trucking Association, San Francisco .....June 28-30

2nd Joint Automatic Control Conference, Sponsored by: ISA, AICHE, AIEE, ASME, IRE, University of Colorado, Boulder, Colo. .....June 28-30

Western Plant Maintenance and Engineering Show, Los Angeles July 18-20

Society of Automotive Engineers, West Coast Meeting, Portland, Ore. .....Aug. 14-17

American Society of Mechanical Engineers, International Heat Transfer Conference, Boulder, Colo. Aug. 28-Sept. 1

Combined Farm, Construction and Industrial Machinery; Powerplant; and Transportation Meetings. (Including Production Forum and Engineering Display), Milwaukee Sept. 11-14

Instrument Society of America, Fall Instrument - Automation Conference, Los Angeles .....Sept. 11-15

Society of Automotive Engineers, National Farm, Construction, and Industrial Machinery Meeting, Milwaukee .....Sept. 11-15

Society of Plastics Engineers, "Plastics for Tooling," Indiana Section, Indianapolis .....Sept. 12

Marking Device Association, Convention, Chicago .....Sept. 13-14

Non-Ferrous Founders Society, Annual Meeting, Shawnee-On-Delaware, Pa. .....Sept. 18-20

Steel Founders' Society of America, Fall Meeting, Homestead, Hot Springs, Va. .....Sept. 24-26

2nd Industrial Building Exposition and Congress, New York....Sept. 25-28

American Production and Inventory Control Society, 4th Annual National Conference and Technical Exhibit, Chicago.....Sept. 28-29

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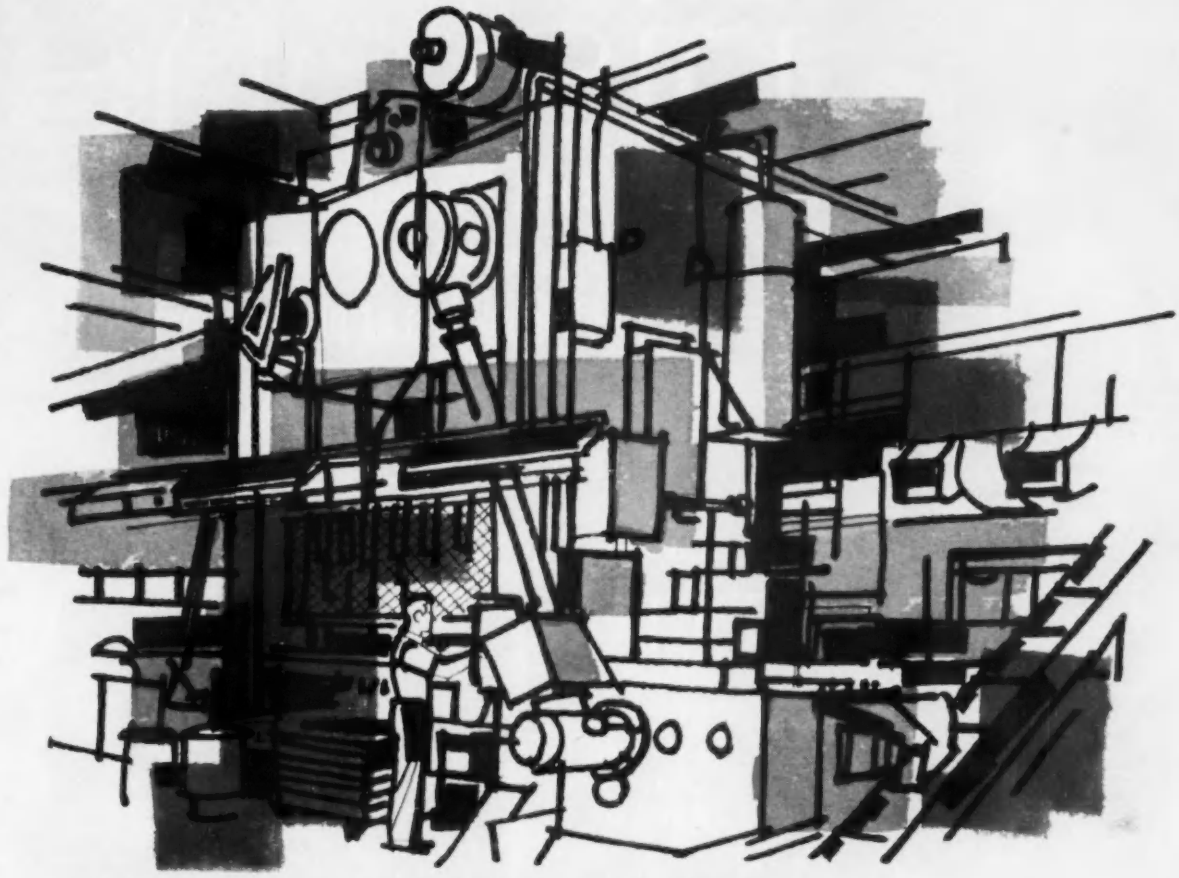
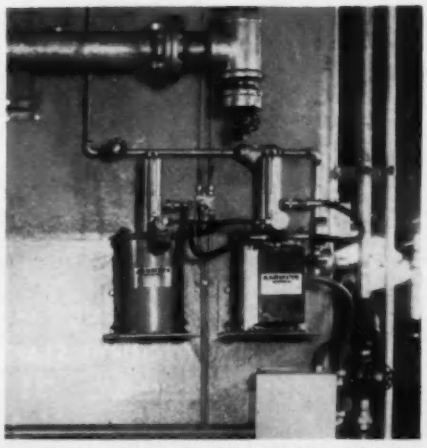


ALEMITE ACCUMATIC SYSTEM LUBRICATES 300-TON PUNCH PRESS

Automatically...in seconds!



An Alemite Accumatic Centralized Lubrication System lubricates the key points on this 300-ton, 20-foot high Punch Press which can produce 1200 completed stampings per hour at 25 strokes per minute, based on 80% efficiency.

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This installation is typical of the versatility and wide range of Accumatic's precision lubrication . . . typical of how Alemite's experience and products work together to provide the right lubrication system for machines of all types and sizes. Today, find out how Alemite and Accumatic can do a *big job for you,* too! *Send for free illustrated literature . . . or contact your Alemite representative.*

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gives positive clearance control

they're **QUIET**...

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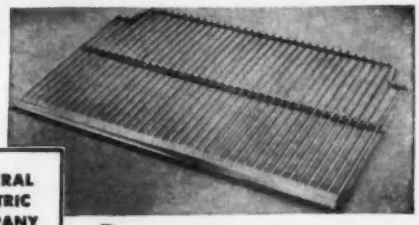
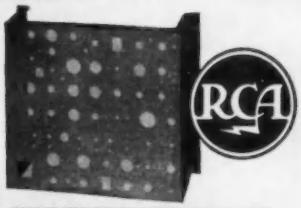
SPECIAL EFFECTS

Iridite, in combination with other Allied Research processes, can provide a wide variety of finishes. As an example, Iridite 8-P applied to zinc or cadmium, followed by an application of Irilac, gives a highly attractive simulated brass finish.



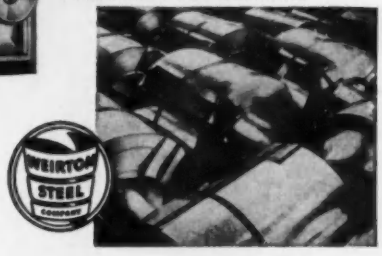
GENERAL ELECTRIC COMPANY



RCA

Medalist

NATIONAL LOCK COMPANY



WEIRTON STEEL COMPANY

IRIDITE—a specialized line of chromate conversion coatings for nonferrous metals. Easily applied at room temperatures with short immersion times, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel. Special equipment, exhaust systems or highly trained personnel not required.

For complete information on Iridite, contact your Allied Field Engineer. He's listed in the yellow pages under "Plating Supplies." Or, write for FREE TECHNICAL DATA FILES.

Allied Research Products, Inc.

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Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

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Lifting Loads or Laying Roads

US® AXLE SHAFTS "Live Longer"

HUSKIEST...

workers in earth-moving equipment, U.S. axle shafts measure up in more work-power, longer work-life and lower work-cost.
Precision made from finest alloy steels, heat-treated and toughened to move more tons of earth . . . on the highway and off . . . lay more road at less cost. Remember, wherever the work-load is heavy, the *new word* in axle shafts is *work-dimension* — the *last word* is *U.S.*

FREE Valuable Booklet: "Causes and Prevention of Axle Shaft Failures" — write today for yours.

Busiest Axle Shafts in the Business

SEE your U.S. Axle Jobber — he has the exact replacement shaft for every car or truck.

FOR U.S. "Custom-Engineered" axle shafts as original equipment, send us prints and specs for quotes.

The US® AXLE COMPANY, INC.
Since 1920
Pottstown, Pennsylvania

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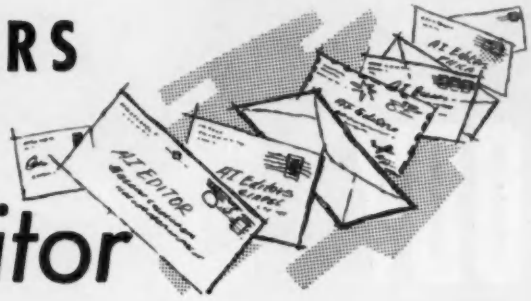
LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

ENGINEERING REFERENCE

We would like to know the price of your publication, AUTOMOTIVE INDUSTRIES. Our library here does not get it, and I think it is a publication that should be available to our engineering students. There are about 400 mechanical engineering students.

John C. Humphries
Head, Mech. Engr. Dept.
Tri-State College
Angola, Ind.

● *Very pleased to send you the information.—Ed.*

READER SERVICE

We should like to take this opportunity to thank you for the writeup on our Constant Horsepower Hydraulic Milling Spindle in the April issue of AUTOMOTIVE INDUSTRIES.

A number of inquiries have been received on this item and we do appreciate your sending them to us for follow up.

Ralph Lagerfeldt
Executive Vice President
Colonial Broach & Machine Co.
Warren, Mich.

ORDER OF MERIT

We have read with a great deal of interest the extremely thorough statistical details of American cars in your journal (A. I.'s Statistical Issue).

We produce a relative appraisal of small family cars, a copy of which I am enclosing.

It occurs to us also that this method of appraisal could be adapted to cover American cars in various categories, although from the point of view of manufacturers, the actual order of merit would be of less importance than the relative appraisal contained in each column. Our own classification shows up the advantages of advanced engineering thought over purely esthetic appeal and this would undoubtedly apply to a similar appraisal of American cars which are so frequently misunderstood on this side of the Atlantic. As it is possible to obtain reliable data of cars produced and their $ values, we would add some columns such as number of cars produced (during test periods), their $ value, number of cars with automatic transmission and their $ value, etc. All this should produce some most instructive factors of interest to economists, industrialists, and engineers.

Our group is especially well placed to provide impartial information and test reports on vehicles as well as purely technical and engineering appraisals of automotive development.

If that service would be of any use to your journal, perhaps you would kindly get in touch with us.

Victor Winstone
Automotive Technical
Advisory Service
London, England

● *Any comments?—Ed.*

INDY PREVIEW

We enjoyed reading the splendid "Indianapolis Preview" in the May 1 issue of AUTOMOTIVE INDUSTRIES. The material presented was well written and the photographs excellent.

Accept the compliments of Lou Meyer and organization for the fine article and thanks for the nice mention given our product.

Leo Goosen
Chief Design Engineer
Meyer & Drake
Engineering Corp.
Los Angeles, Calif.

IF you're making plans for a new model or new product, soon to be launched into sales orbit, let Southern fasteners help assure its success. Sales, in great part depend on quality fasteners that hold your product together.

Southern specializes in the manufacture of quality fasteners made in USA with USA materials. Build quality into your products with Southern fasteners.

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Manufacturing and Main Stock in Statesville, North Carolina

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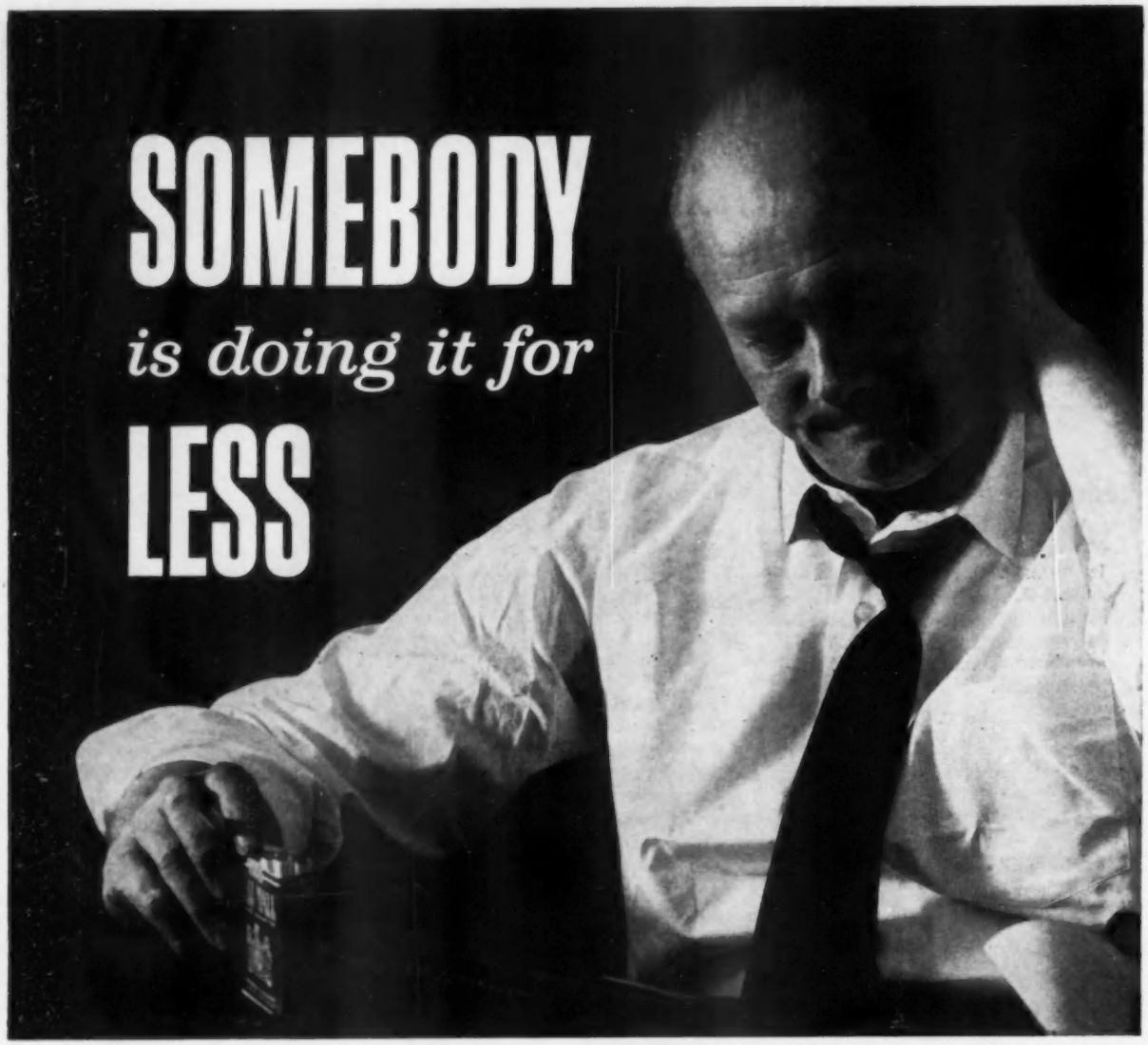

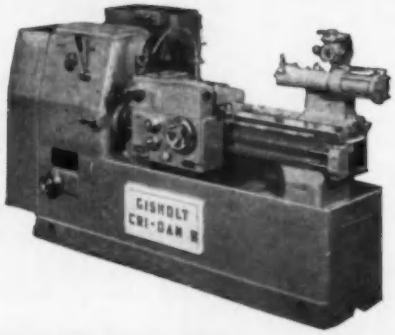

Gisholt CRI-DAN Model B Automatic Threading Lathe—Sets up in 8-15 minutes. Uses inexpensive single-point carbide tools to produce all types of internal and external threads: single- or multiple-start, coarse or fine, left- or right-hand, straight or tapered, standard or special form—in any material, including new high-tensile, hard alloys.

Optional accessories for the CRI-DAN B permit you to combine precision threading with tracing, turning, boring and facing cuts in one fast, automatic cycle. Other models are available. Call your Gisholt Representative or write for Catalog 1215.

While others are saving 30% to 80% with a new but proved threading technique, can you afford to stay with conventional methods?

With a Gisholt CRI-DAN High-Speed Threading Lathe, you can now use inexpensive single-point carbide tools to produce *quality* threads—simple or complex—*automatically*. A large number of progressive manufacturers (perhaps your toughest competitors) have found that the CRI-DAN technique cuts costs throughout the plant—with *direct* savings in initial costs, reduced threading times and tooling requirements—with *indirect* savings in tool inventory, materials-handling, floor space and planning.

Whether you're threading in lots of 6 or 600, the CRI-DAN technique will permit you to do it for less.

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

Turret Lathes • Automatic Lathes • Balancers • SuperFinishers® • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee

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Today's best buy in a weather-resistant finish

TOUSEY S|Q DURACOTE

Here's why:

S/Q Duracote has greater film flexibility retention than most finishes (tests show up to 100% more over standard industrial finishes).

S/Q Duracote is the product that will give an approximate automotive finish without the use of hi-baking equipment or primers, at only two-thirds the cost.

S/Q Duracote eliminates costly retreating of machines or equipment that are stored in unprotected areas for indefinite periods of time before shipping to customers.

Learn more about this remarkable product . . . a brief letter on your stationery will bring complete information.

TOUSEY PRODUCTS
DURACOTE for DURABILITY

TOUSEY VARNISH COMPANY

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520 West 25th Street, Chicago, Illinois
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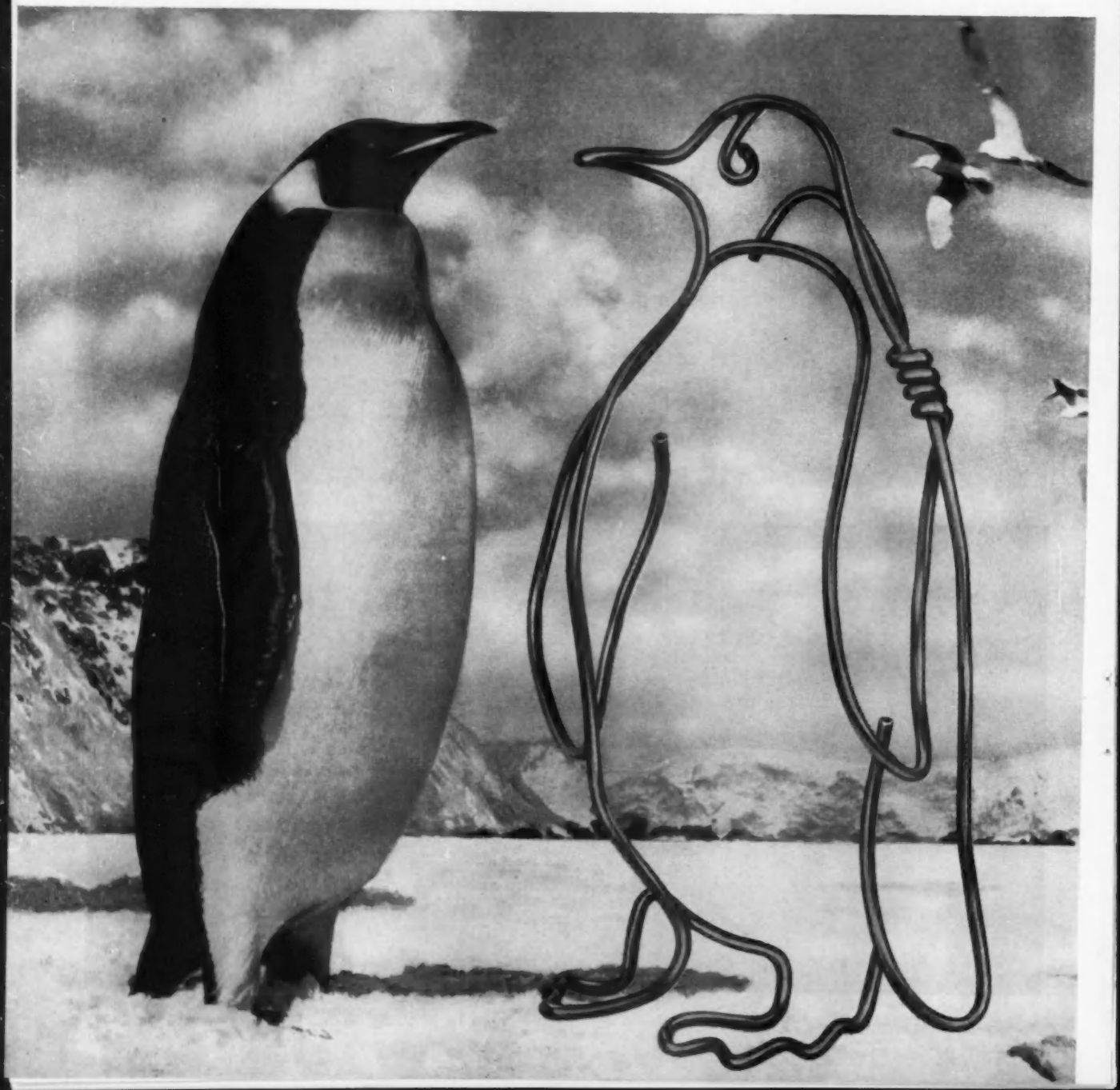
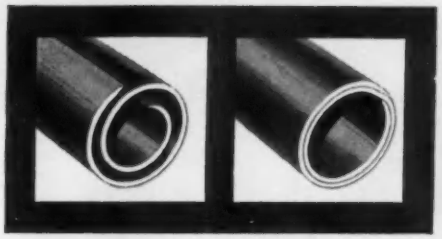
Bundy can mass-fabricate practically anything



Need tubing? Maybe just a few simple bends . . . or millions of complex fabricated tubing parts. But, whatever your tubing requirements, come to Bundy. The important reason for Bundy's precision fabrication is Bundyweld® steel tubing. Standard wall thickness and O.D. of Bundyweld are held to +.002″ to −.003″. Bundyweld meets ASTM 254; Govt. Spec. MIL-T-3520, Type III. Precision comes first, but Bundy plants are also geared to give you the cost advantages of mass-fabrication. Be sure you get the most for your tubing dollar by talking to Bundy first. Call, write or wire: Bundy Tubing Company, Detroit 14, Michigan.

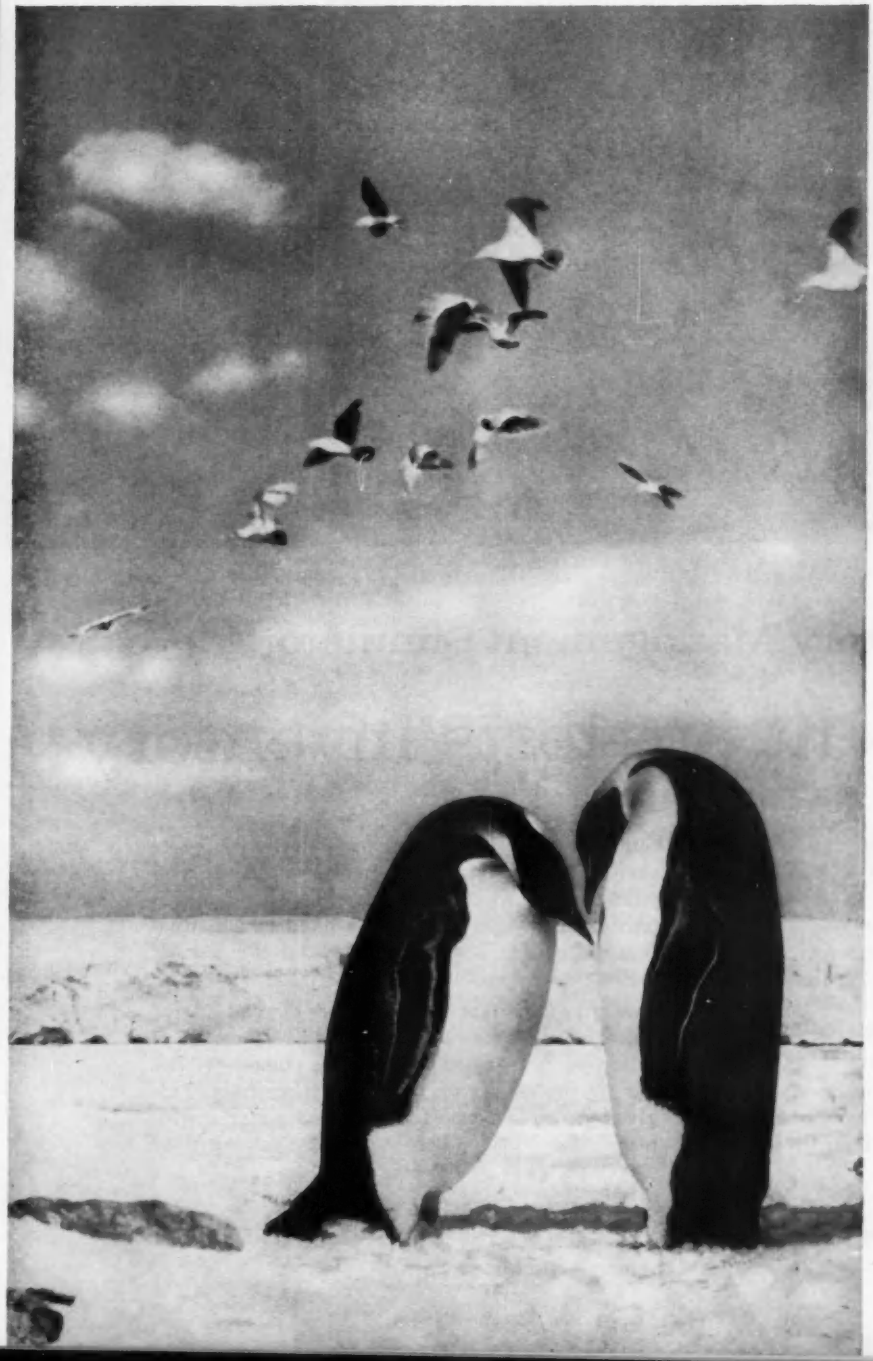
BUNDY TUBING COMPANY • DETROIT 14, MICH. • WINCHESTER, KY. • HOMETOWN, PA.

World's largest producer of small-diameter tubing. Affiliated plants in Australia, Brazil, England, France, Germany, Italy, Japan.



Bundyweld, double-walled from a single copper-plated steel strip, is metallurgically bonded through 360° of wall contact. It is lightweight and easily fabricated... has remarkably high bursting and fatigue strengths. Sizes available up to ⅝″ O. D.

Bundy can mass-fabricate small-diameter steel tubing to solve a wide variety of design problems. The Bundyweld tubing shown is (1) expanded, (2) sheared and flattened, (3) expanded and slotted, (4) special formed and threaded, and (5) flanged.



BUNDYWELD® TUBING

Circle 117 on Inquiry Card for more data

New IBM Inventory Management Simulator

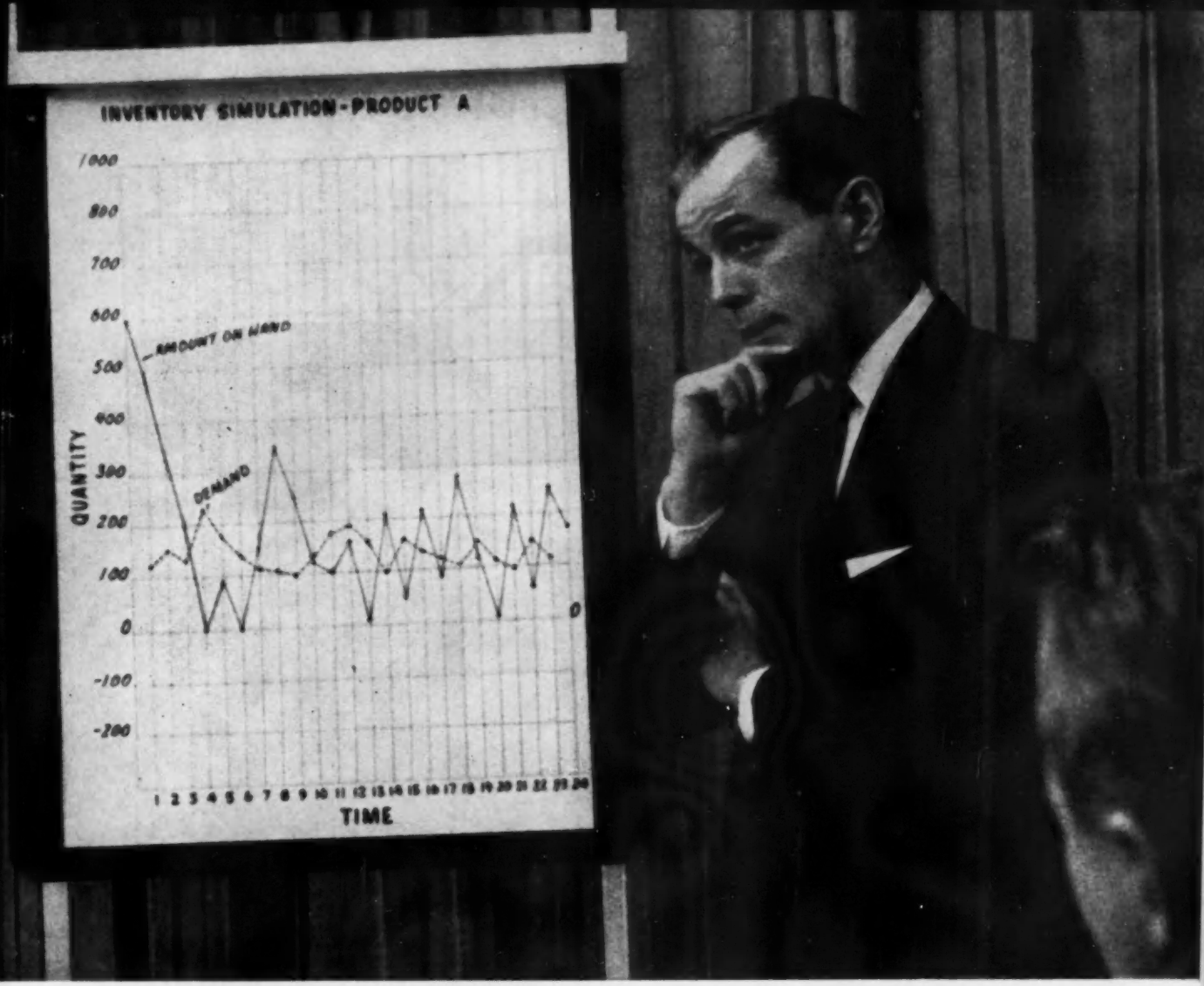
Management pre-tests inventory

How often have you wanted to peer into the future... see the probable results of your inventory policy? **Now you can.** An IBM data processing technique—Inventory Management Simulation—establishes the computer as an invaluable management tool for problem solving and decision making.

This technique lets you test and evaluate alternate plans electronically without disrupting present operations. In effect, it lets you turn *hindsight* into *foresight*.

Simulation is performed by creating within the computer a mathematical model of an inventory control system. Then the model is subjected to various demand situations. In every case, the computer reports what would have happened had this particular system been used to handle each situation. Of course, both the model and the demand factors can be endlessly varied.

Here's the important thing: Through simulation, the trial-and-error method of determining a course of action is performed within the computer—not during the course of your firm's business. This gives you a fast way to test plans under a wide range of conditions before actually putting them



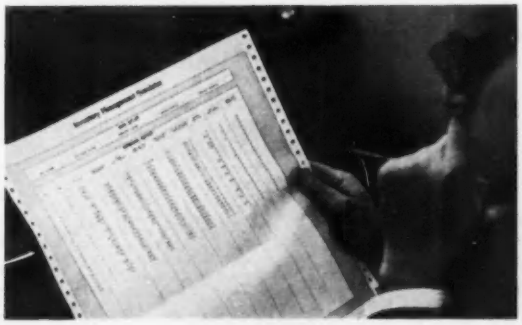
LOOKING AHEAD. Management has run a computer simulation of a proposed inventory plan. Company executives (above) now examine charted results showing how the plan might work, what problems might arise, where improvement might be sought. Print-out sheet (below) from an IBM computer contains facts needed to judge long-range results of a given inventory control plan. Inventory Management Simulation takes much of the guesswork out of planning.

decisions with electronic speed

to use. Unprofitable or inadequate courses of action show up in advance. You avoid them. And you select with confidence the system best suited to your firm's objectives.

Getting started. If you are an IBM customer, you can take advantage of the Inventory Management Simulation Program at once. IBM helps you collect the facts you need... and helps you set up a computer program to analyze them.

Ask your IBM representative to show you how this new technique can uncover *your* most effective inventory policy.



IBM®
DATA PROCESSING

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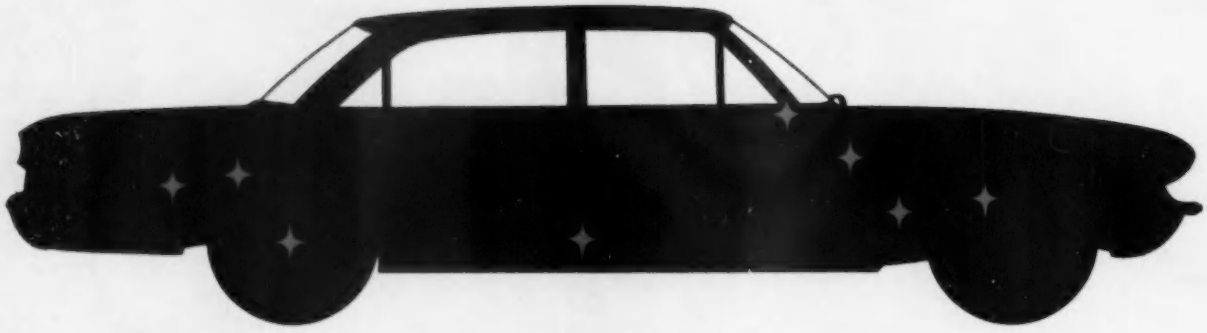
TUBING TAKES NEW TURNS...



...WITH iNGENUity

Ingenuity—originality, inventiveness, skill—aptly describes the contributions that Rochester people are making to automotive engineering with Rochester Steel Tubing.

The new Buick Special is one of America's fine cars that make the most of Rochester Steel Tubing—and Rochester ingenuity—for several important functions. Buick recognizes the widening possibilities for steel tubing along with other quality car manufacturers, who call on Rochester Steel Tubing for applications ranging from fuel lines to ventilator tubes, from control rods to brake lines.

WHY?

Automotive engineers specify Rochester Steel Tubing frequently for several important reasons. It's versatile. It saves weight. It satisfies the most rigorous reliability standards . . . far beyond specifications.

If you have an engineering problem that turns on tubing, call on the originality, inventiveness and skill of Rochester people. Just get in touch with a Rochester Steel Tubing Engineer for complete details.

GM

Rochester Reflects Reliability

GENERAL MOTORS

RP

STEEL TUBING BY ROCHESTER PRODUCTS

ROCHESTER PRODUCTS DIVISION OF GENERAL MOTORS. ROCHESTER. NEW YORK

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DESIGN FOR SUPERIOR PERFORMANCE

with Lord

vibration/shock/noise control

how Lord can help improve performance

High-strength elastomeric mountings and joints are custom designed to control dynamic disturbances, reduce wear, accommodate relative motion . . . thereby upgrading performance, reliability, acceptance. These compact, easy-to-install units resist severe conditions, often outlast metal parts, never need lubrication.

on crawler tractors . . .

- **Engine mountings** isolate engine disturbances.
- **Radiator mountings** prevent fatigue failure.
- **Instrument panel mountings** improve instrument life and accuracy.
- **Seat mountings** enhance operator safety and comfort.
- **Load equalizer joints** absorb road shock, accommodate misalignment and relative motion.
- **Diagonal brace pivot joints** eliminate metal-to-metal contact and lubrication.
- **Trailer hitch mountings** absorb starting-stopping shock.

Crawler tractors can be designed for greater handling ease, lower maintenance requirements and longer component service life.

Lord-engineered vibration control is a proved route to this superior performance . . . and to the competitive edge it will give your product.

Suggested here are seven performance-improving ideas which should be considered early in the design of your next model. Utilizing rubber with a backbone of steel, Lord mountings cushion brutal jolts, isolate damaging vibration, "give" under frame distortion. As a result, your tractor rides easier and handles better, components last longer and need fewer repairs.

Lord engineers are ready to help you design for superior performance. Take advantage of Lord experience—contact your nearest Field Engineering Office or the Home Office, Erie, Pennsylvania.

LORD®

FIELD ENGINEERING OFFICES

ATLANTA, GEORGIA · CEdar 7-9247
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"In Canada—Railway & Power Engineering Corporation Limited"

LORD MANUFACTURING COMPANY · ERIE, PA.

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TO MEET THE CHALLENGE OF THE FUTURE

Over one-million square feet of floor space (bigger than twenty-three football fields). That's the size of Kelsey-Hayes' new corporate headquarters and automotive wheel manufacturing facilities at Romulus, Michigan.

With centralized control and all facets from development through production under one roof, the new Kelsey-Hayes plant is equipped with the best . . . with everything it takes to meet the challenge of finest in wheels for the great new cars of the future. Kelsey-Hayes Co., Romulus, Mich.

WORLD'S LARGEST PRODUCER OF AUTOMOTIVE WHEELS, HUBS AND DRUMS.

KELSEY-HAYES

AUTOMOTIVE, AVIATION AND AGRICULTURAL PARTS. HAND TOOLS FOR INDUSTRY AND HOME

K H COMPANY

OPERATIONAL PLANTS: Detroit, Jackson and **Romulus, Michigan**; *Los Angeles, California; Philadelphia, Pa.; Springfield, Ohio; New Hartford and Utica, N. Y.; Davenport, Iowa; Rockford, Illinois; Windsor and Woodstock, Ontario, Canada.*

Circle 121 on Inquiry Card for more data

A world of precision plastics . . . from Plastene

More and more automobile manufacturers are turning to molded plastics because of their versatility, utility and low cost. Typical of Plastene's unique and varied contributions to the automotive field is one of its recent developments—an in-line nylon gasoline filter bowl body. Plastene not only designed this rugged unit but performed the intensive evaluation and testing required to assure optimum performance and long life.

What does Plastene's rigid emphasis on precision mean? It means that Plastene draws on its outstanding engineering and fabrication skills to control every step of the manufacturing process. Which, in turn, means that every item from the beginning to the end of each production run is turned out to Plastene's uncompromising quality standards.

Plastene's unusual skills and abilities, its three strategically located plants in Crawfordsville, Ind., Norwich, Conn., and Anaheim, Calif., are available to you. Plastene offers you a world of polystyrene, polyethylene, acrylic, polypropylene, acetate, delrin and nylon automotive products — made to Plastene precision standards. Write today for complete information.

PLASTENE

Plastene Corporation, Crawfordsville, Indiana • Subsidiary of The American Thermos Products Company

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small in size...

BIG in dependability...

Take this arm rest screw, for instance. Only three inches long, yet it is correct in materials and specifications to do the most dependable job. The same applies to National Lock connecting rod bolts, engine head bolts, bumper and wheel bolts, hood latches, catches, plastic connectors, distributor caps and hardware of all kinds. National Lock's design-engineering ability and plant capacity make it a leading supplier of quality hardware, fasteners and plastic components to over 40 different O.E.M. markets. And this means experience at every step of engineering and production . . . diversified experience resulting in lower product costs, better product features and finer product quality. Write us on how we can answer your requirements . . . large or small.

NATIONAL LOCK

INDUSTRIAL HARDWARE DIVISION • NATIONAL LOCK COMPANY • ROCKFORD, ILLINOIS

INTERNATIONAL DIVISION 13 E. 40TH ST., NEW YORK, N. Y. • CABLE: ARLAB

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GOODYEAR

Q: What do Goodyear Earthmover Rims have that no others have?

A: MORE times FOUR

1. MORE rims on the job: More tons are hauled on—more earth-moving equipment rides on Goodyear rims than on any other kind. Result: You reap the benefits of the widest, soundest experience in rim design, manufacture and use.

2. MORE kinds of rims: Maximum rim performance stems from proper specification. Goodyear makes the *only complete line* of earthmover rims. Result: The choice that permits you to get exactly the right rim for the job.

3. MORE rim engineering help: Goodyear has more engineers designing *and selling* rims than any other company. And they know tires, too. Result: The help you need in choosing the right rim for top performance—longer tire life.

4. MORE rim "firsts": The first *true* earthmover rim, the first 5° rim, the first tubeless rim—in fact, every major earthmover rim advance was made by Goodyear. Result: The very latest in rim design and manufacture at work, for you.

What better reasons for choosing Goodyear as your rim supplier? Only these: The desire and ability to design and build any rim that may be needed for *tomorrow's* earth-moving equipment. No matter what your rim needs or plans, you'll find it pays to call on Goodyear. See your local rim distributor, or write: Goodyear, Metal Products Division, Akron 16, Ohio.

Lots of good things come from

GOODYEAR

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Circle 125 on Inquiry Card for more data →

Machining greatly reduced by concentricity of

REPUBLIC ELECTRUNITE MECHANICAL TUBING

CRITICAL PART IN POWER STEERING PUMP made with Republic ELECTRUNITE Mechanical Tubing. Keyed bushing fits over engine crankshaft, provides pump drive for power assist. Close tolerance machining is essential for dual mechanical-hydraulic function.

Precise concentricity of ELECTRUNITE Mechanical Tubing solved a machining problem and cut costs for Eaton Manufacturing Company, manufacturers of power steering pumps.

At the heart of the power steering pump is a bushing made from heavy wall ELECTRUNITE which serves as the internal shaft of the unit. It fits on the crankshaft of the car and drives the power steering pump.

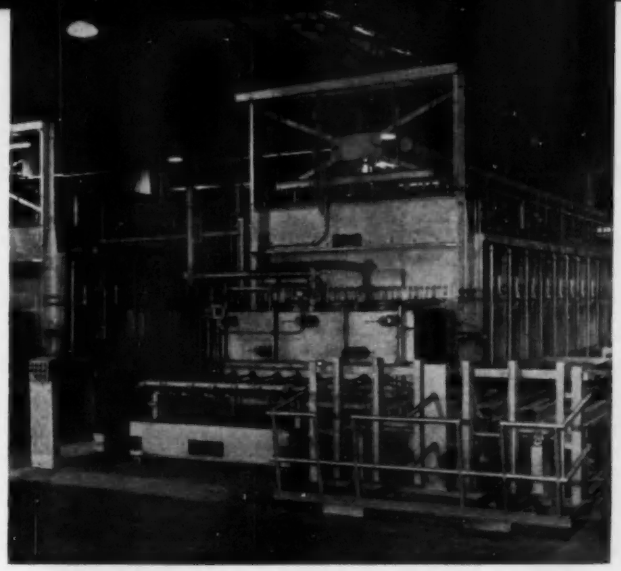
The tubing is ground on both the ID and OD. A keyway is broached on the ID the entire length of the part, approximately 2⅝ inches. Another keyway is then milled on the OD.

Since Eaton must work to very close tolerances on the part, concentricity of the OD and ID of the tubing are most important to minimize machining.

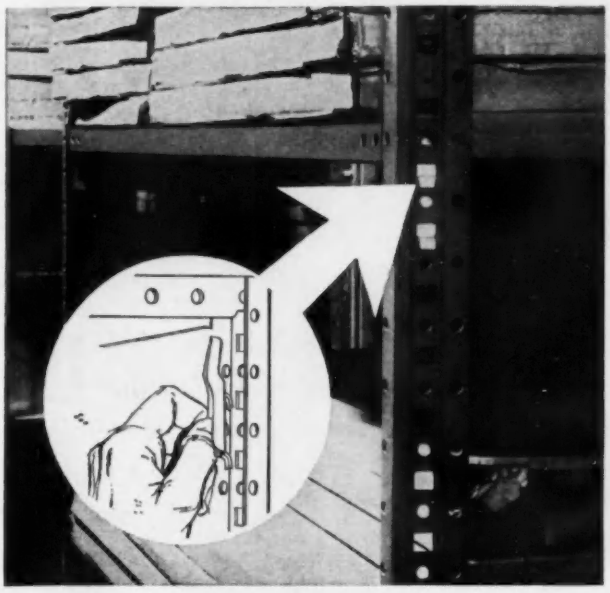
In addition, as it is part of a hydraulic system, the steel must be structurally sound without flaws of any sort.

This is another example of how precision fabricated Republic ELECTRUNITE provides high quality and cost savings for critical applications.

ELECTRUNITE is available in a wide range of sizes, gages, and wall thicknesses in both carbon and stainless steels to meet your needs. For full information call your Republic representative or send coupon below.



NEW ANNEALING FURNACES provide maximum heat treating capacity for cold extrusion steel. Quality of steel produced at the Chicago Bar Mill attains a high level of uniformity through heat treatment in two new atmosphere-controlled annealing furnaces. These new furnaces provide the capacity to assure prompt delivery of orders for heat treated steels.



REPUBLIC CLIP SHELVING saves valuable floor space. Complete line includes shelves, parts, accessories, and related items. Every piece is Bonderized. Erection is quick and easy, no tools needed. Adjustable arrangements meet changing shelving needs. Let your Republic representative solve your shelving problems. Write for information.

PROBLEM-SOLVING KNOW-HOW AND EXPERIENCE have made Republic a leader in custom production of Fastener and Formed Parts "Specials." Whenever standard fasteners or formed parts can't do the job, you'll save time and money by contacting Republic. The complete job—design, engineering, and production—can be handled by Republic's experienced staff and extensive facilities. Mail coupon for complete information.

REPUBLIC STEEL

REPUBLIC STEEL

REPUBLIC HAS THE FEEL FOR MODERN STEEL

Strong, Modern, Dependable

REPUBLIC STEEL CORPORATION
DEPT. AI -2199-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send me more information on the following products:

- ☐ Republic ELECTRUNITE® Mechanical Tubing
- ☐ Republic Steel for Cold Extrusions
- ☐ Republic Clip Shelving
- ☐ Republic Special Fasteners

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Charles Suenger, Chief Metallurgist for the Illinois Tool Works in Chicago, Illinois.

CHARLES SAENGER tells how Lindberg equipment produced better cutters and hobs

QUOTE

"Unground form cutters and hobs require certain refinements above and beyond those needed for ground tools. Our Lindberg-Upton salt-bath units and daily chemical control of the salt-bath solutions help us maintain an excellent surface condition and hold to critical dimensional tolerances and close hardness range required by these tools. We are very well pleased with the consistent, trouble-free service our Lindberg-Upton furnaces have provided month in and month out."

The success of Illinois Tool Works in producing their top-quality unground form cutters and gear hobs is a well-established fact. The banks of Lindberg-Upton furnaces in their plant provide quality control in high speed steel hardening through the ability to hold rigidly the desired temperature and also assure proper salt conditions at all times.

The solution to any salt-bath furnace requirement is easy to find. Just look to Lindberg, and the complete line of Lindberg-Upton high and low temperature furnaces for every production process where salt-bath equipment is needed. For complete information just call the nearest Lindberg representative (he's listed in your classified phone book) or, if you prefer, write us direct. Salt Bath Furnace Division, Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois.

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, Spain, Switzerland and West Germany.

LINDBERG
heat for industry

One of the Lindberg-Upton Salt Bath Furnaces at Illinois Tool Works

OHIO RUBBER

"CUSTOMEERED COMPONENTS BASIC TO INDUSTRY"

Why it profits to use ORCO IDEA PARTS

OHIO RUBBER IS THE GOOD SOURCE FOR THE AUTOMOTIVE INDUSTRY

ORCO has supplied quality rubber parts for the automotive industry for more than half a century. And, the parts above illustrate the scope of precision problems tackled—and solved on regular production basis—by Ohio Rubber.

ORCO "CUSTOMEERING" starts saving you money the moment performance requirements are checked—the materials recipe for your part is compounded—and, if practical, expense-shaving design modifications suggested.

ORCO CAPACITY for performance—integrated mold and die service; complete facilities for molding, extruding, and bonding-to-metal; single source control and responsibility—eliminates any question of product quality or delivery.

In the automotive industry—and many others—ORCO IDEA PARTS of rubber, synthetic rubber, silicone rubber, polyurethane, or flexible vinyl offer the original equipment manufacturer improved product performance, longer operating life. For more information on how ORCO "CUSTOMEERING" can go to work for you—write today to The Ohio Rubber Company, Willoughby, Ohio.

AU-160

ORCO **THE OHIO RUBBER COMPANY**

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A DIVISION OF THE EAGLE PICHER COMPANY

EAGLE EP PICHER

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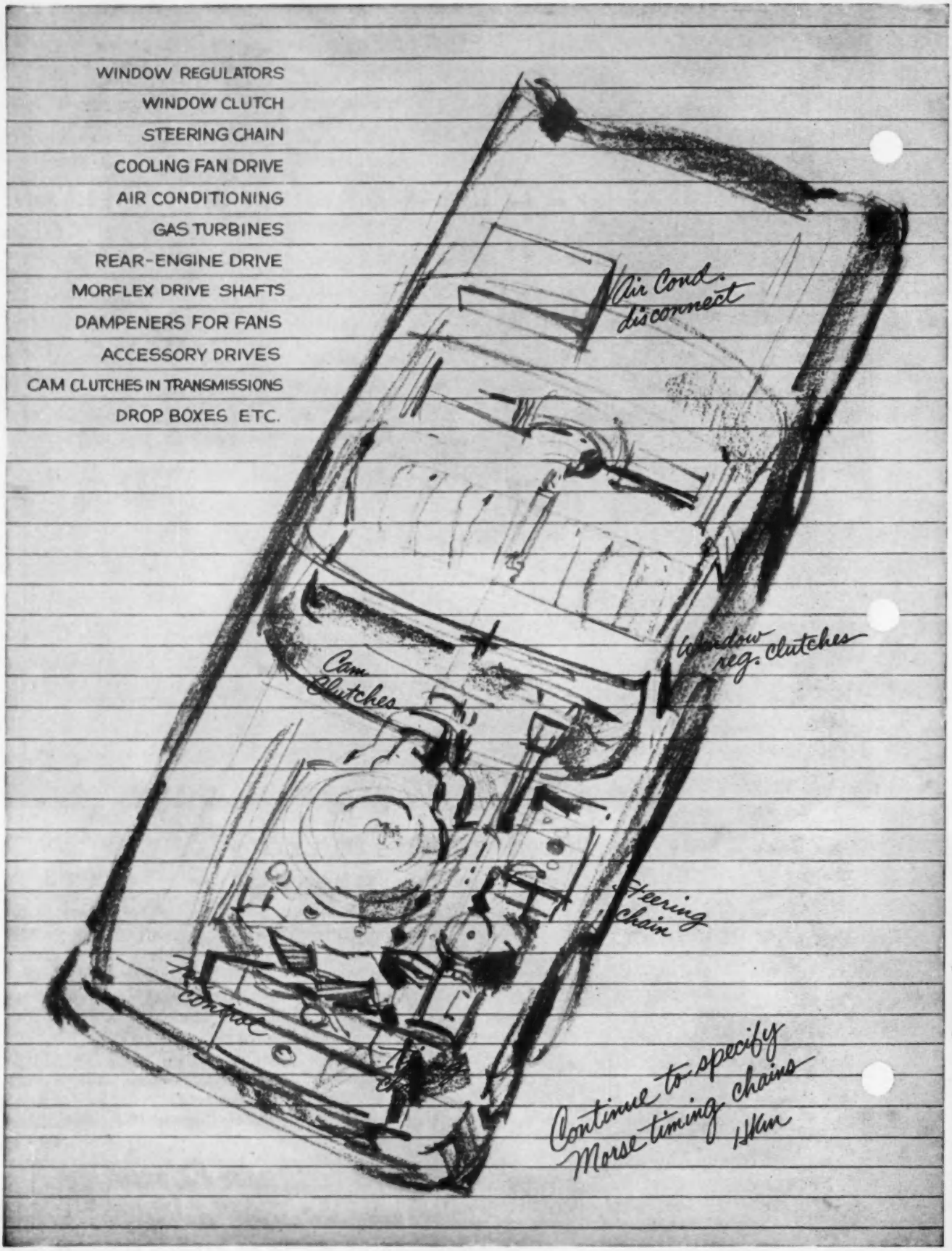

WINDOW REGULATORS
WINDOW CLUTCH
STEERING CHAIN
COOLING FAN DRIVE
AIR CONDITIONING
GAS TURBINES
REAR-ENGINE DRIVE
MORFLEX DRIVE SHAFTS
DAMPENERS FOR FANS
ACCESSORY DRIVES
CAM CLUTCHES IN TRANSMISSIONS
DROP BOXES ETC.
Air Cond. disconnect
Window reg. clutches
Cam Clutches
Steering chain
Compr.
Continue to specify Morse timing chains
I Kim

HOW MORSE HELPS ENGINEERS MAJOR IN IMAGINATION

Let your imagination go! Design your power drives the way you think they should be

For, no matter what type of drive you come up with, chances are that Morse will have the equipment to implement it. And the know-how to help you perfect it!

It's true for accessory drives—for windows, fans, seats and the like. It's true for timing chains, the field which Morse has *always* led. And, now it can be true even for turbine engines.

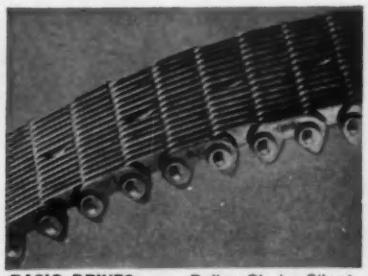
Morse's business is the *complete* power train—basic drives, speed reducers, couplings and clutches. It offers each of these in a variety of types and sizes no other single source can match. It offers them singly or in combination. Literally, Morse can help you design—and then *supply*—systems that deliver power to everything from a car window to an oil rig!

So let your imagination go. Let the Morse man help you find a better way. Call him, or write: Morse Chain Company, Dept. 36-61, Ithaca, N.Y. Export Sales: Borg-Warner International, Chicago 3, Ill. In Canada: Morse Chain of Canada, Ltd., Simcoe, Ontario.

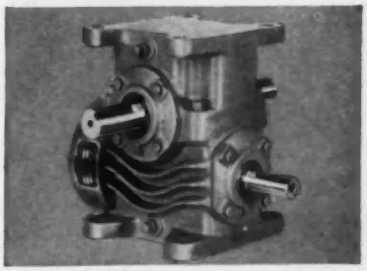
MORSE

A BORG-WARNER INDUSTRY

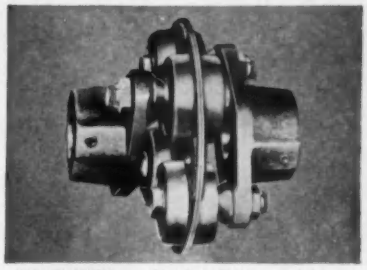
BW



BASIC DRIVES . . . Roller Chain, Silent Chain, Exclusive Hy-Vo®, "Timing"® Belts and Sprockets.



SPEED REDUCERS . . . Eberhardt-Denver "RW" PoweRgear® Reducers, Gearmotors, Conveyor Drives, Miter Boxes, Worm Gear Reducers, Helical Reducers.



COUPLINGS . . . Flexible Roller and Silent Chain, Morflex, single and double; and Morflex Radial and Marine.

CLUTCHES . . . Morse Cam (Over-Running, Indexing, Back Stopping), Pullmore, Over-Center, Torque Limiter, and Centrifugal.

ONLY MORSE OFFERS ALL 4

?
YOUR POWER DRIVE

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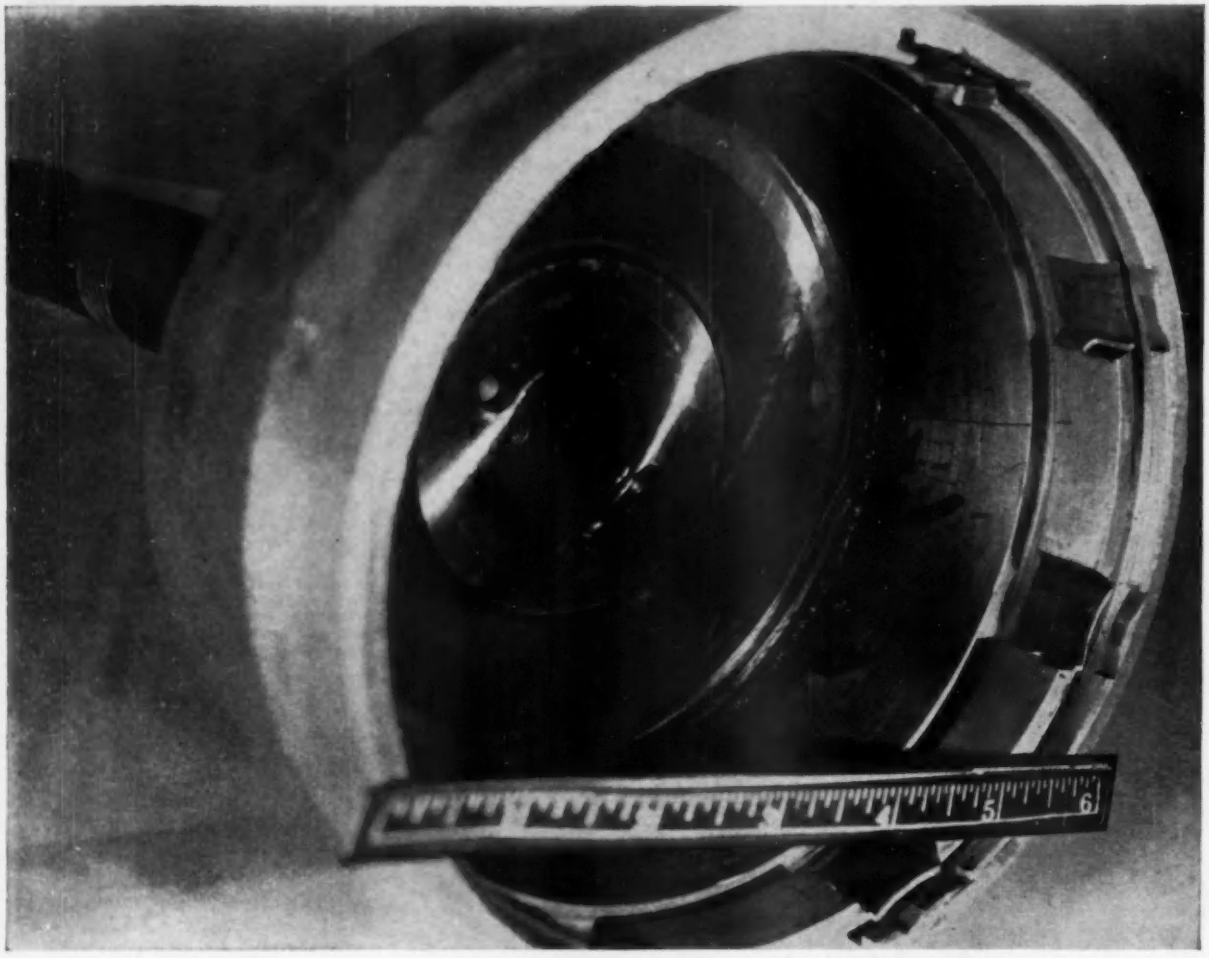

CYCLEWELD CHEMICAL PRODUCTS DIVISION, CHRYSLER CORPORATION

SEE WHAT RUBBER-BASE ADHESIVE CAN DO?

This is the housing of an automotive torque converter. It's joined to the output shaft by a thin film of thermoset cement.

The converter has just undergone torsional tests that wrecked its mechanical parts—with no effect whatever on the metal-to-metal bond. This bonding job is an achievement of Cycleweld Chemical Products Division of Chrysler Corporation.

A similar cement, made of nitrile rubber and Durez® phenolic resin, cut the cost of assembling an all-aluminum truck tailgate from $15.18 to $1.75 by eliminating 211 rivets and 42 welds.

Other heat-setting cements that marry rubber and phenolic resin show promise for:

- building new strength and quietness into car doors, deck lids, and hoods by edge-bonding instead of tack welding.
- attaching metal trim without drilling holes.
- easy-to-cast aluminum engine heads and intake manifolds, made in *two* sections bonded together with a leakproof, heatproof seal.

If you have a tougher-than-usual bonding problem—or expect to have one—now's the time to see what a rubber-phenolic adhesive can do for you. We'll be glad to put you in touch with people who make such adhesives.

We don't make these adhesives. We just supply some of the basic ingredients—phenolic resins that influence the qualities a good structural adhesive must have. Permanent, rigid set. Controlled tack. Heat resistance. Precise sameness from batch to batch. Good storage stability. Many superstrong adhesives are the result of teamwork between rubber chemists and Durez resin chemists backed by 40 years of experience.

DUREZ PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION, 8206 WALCK RD., NORTH TONAWANDA, N. Y.

HOOKER CHEMICALS PLASTICS

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Circle 130 on Inquiry Card for more data ⟶

General Electric announces

Carb-O-Lock

the single, most important advance in the whole history of disposable tooling!

Revolutionary... toolholder-insert combination cuts tool costs up to 40%

New
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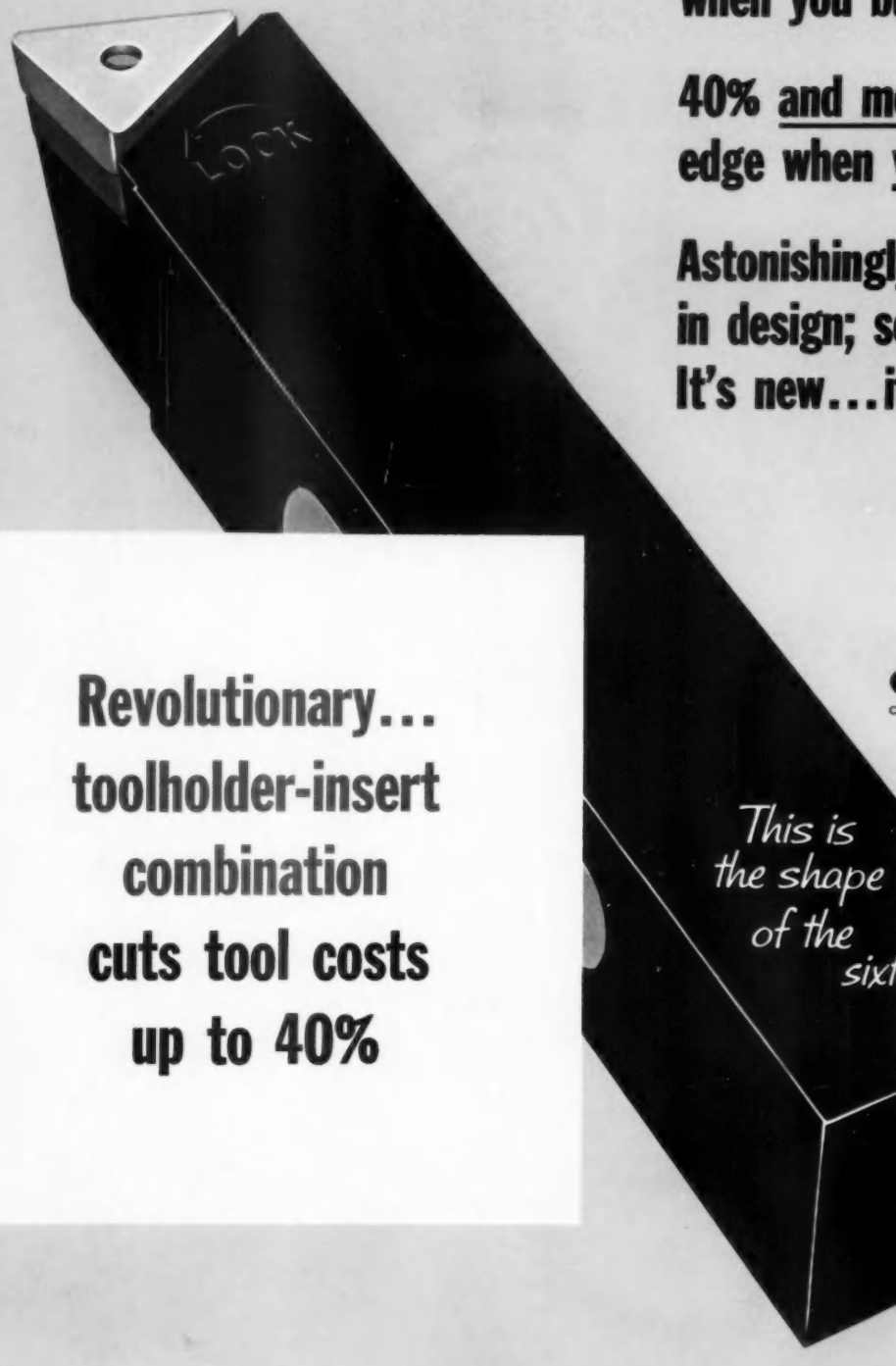

This is the shape of the six

Revolutionary... toolholder-insert combination cuts tool costs up to 40%

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more
buy it!

more per cutting
n you use it!

ngly simple
so easy to use.
..it's Carb-O-Lock!

Think of it! Now you can cut your disposable tooling costs by up to 40%! This revolutionary Carb-O-Lock toolholder-insert combination costs 30% less to buy than ordinary toolholders . . . costs 40% less to use. You save and keep on saving, because savings are designed right into the new Carb-O-Lock toolholder-insert combination.

The Carb-O-Lock is truly unique in toolholder design. *Simplicity* is the key! Carb-O-Lock employs just *three* parts (not including insert) — compared with up to 12 parts in other toolholders. Using a cam-action locking principle, the Carb-O-Lock toolholder makes insert changing and indexing a breeze . . . easy as one, two, three! And the streamlined design of this revolutionary toolholder lets you bring it closer to the work, with unrestricted chip flow. No clamps . . . no "clubheads" . . . no complex mechanisms.

HANDLES MOST OF THE FOLLOWING MACHINING JOBS

Carb-O-Lock toolholders are available right now in toolholder shank sizes from ½" square to 2" square for square inserts and ½" to 1½" on toolholders for triangular inserts to be *used profitably in your shop.* The specially processed close-tolerance, disposable inserts have been developed in Carboloy® Grade 883 for machining cast iron as well as many operations on the following materials: high-temperature alloys, type 300 stainless steel, brass, and bronze.

Look over the features on the next page. See just how this brand new toolholder-insert combination can mean big savings in *your* metalcutting operation. Phone your Authorized Carboloy Distributor and place your order. Then use Carb-O-Lock — designed to bring you even *better profits through better tooling.*

Great! . . . *revolutionary!*

Metallurgical Products Department of General Electric Company, 11173 E. 8 Mile Avenue, Detroit 32, Michigan.

CARBOLOY®
CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMOND • MAGNETIC MATERIALS
THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

Simplicity is the key

Check these features...

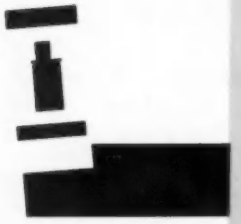
The all-new Carb-O-Lock toolholder-insert combination was developed for just one reason: To reduce your present machining costs. Can it? Yes. Here's why . . . and how.

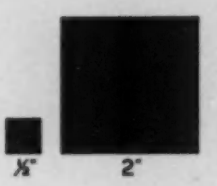
LOW, LOW SILHOUETTE

No "clubheads," clamps, or screws sticking up to take up space or interfere with the chip flow – not even on the smallest size (½" square shank) Carb-O-Lock. Nothing to wash off or wear away.

FEWER PARTS

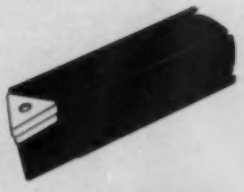
Carb-O-Lock employs just three parts (not including insert): Hard-tough cam pin, Carboloy carbide seat, heat-treated shank. Results—decreased parts inventory, absolute minimum possibility of part failure, greatly reduced downtime, lower replacement-part cost, and lower over-all cost.





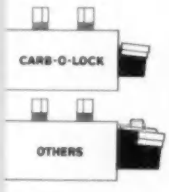
PICK THE ONE YOU NEED

Carb-O-Lock comes in 15 styles, 124 sizes for triangular and square inserts. Shank sizes from ½" square (use it to replace your brazed tooling, too!) to 2" square.



LOOK . . . NO POCKET!

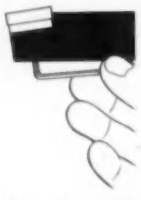
Carb-O-Lock gives you larger end-cutting edge angle because no pocket is needed to retain insert. Can often be used on many tracer applications with limitations on plunge angle.



REDUCED OVERHANG

Reduces space requirements for locking mechanism—less deflection and vibration. This means less insert chipping and breaking, for longer, more consistent tool life.

TOUGHER

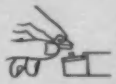


The cam pin in the Carb-O-Lock is a high-alloy bearing steel. Has not broken under the severest use. Cam action forces insert against shank, so insert stays locked in place until *you* loosen it. Cam pin is adjusted from underneath. Self-cleaning, self-locating wrench socket . . . never clogs . . . makes indexing and changing of inserts a breeze.

ONE-TWO-THREE INDEXING

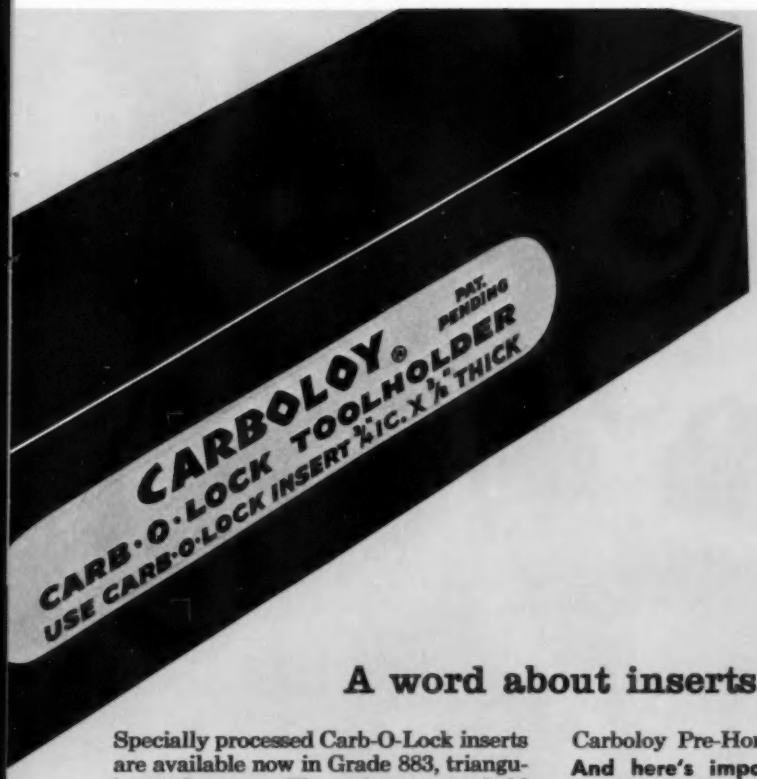
THIS ✓ IS ALL YOU NEED. JUST TWIST,

REPLACE OR INDEX INSERT,

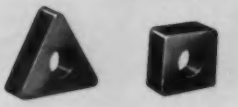


TWIST.

to the new Carb-O-Lock



A word about inserts



Specially processed Carb-O-Lock inserts are available now in Grade 883, triangular and square. These inserts are held to tolerances of ± .002" on ¼" I.C. to ± .004" on the 1" Sq.. They cost 40% less than some precision-ground (± .001") inserts.

These inserts have cutting edges composed of whole carbide crystals which are stress free, and notch free like Carboloy Pre-Honed inserts.

And here's important news. Carb-O-Lock inserts are designed to fit most square or triangular negative rake toolholders you may now be using. This means that while you are changing your operation over to Carb-O-Lock, you can begin by buying the new inserts. Then, as you replace your present toolholders, just order the new Carb-O-Lock. Simple.

NOTE TO SPECIALIZED SHOPS

We can't overstress the importance of the Carb-O-Lock toolholder-insert combination to those who are *not* using carbide disposable tooling in their machining operations. Up until now, if you wanted to use disposable-insert carbide tooling, the cost of the toolholders may have represented an investment that was larger than you cared to make.

Not so now. No longer must you settle for second best. Because the new Carb-O-Lock fits easily into your tooling budget. Now you can have the quality of carbide tooling at the lowest cost ever – even lower than your present tooling. And the broad range and sizes give you the flexibility that makes carbide tooling on small-lot jobs economical. Check into it . . . and see!

. . . and about packaging

Carb-O-Lock inserts come skin-packed on a color-coded card with complete identification which fits in a standard 3" x 5" file drawer for easier storage and inventory, faster identification, simpler handling.

Carb-O-Lock Grade 883 inserts are skin-packed — five or ten to a card depending on size. This means: Easier inventorying • Chipping is eliminated • No surface contamination from handling • Color-coded grade identification • Cards fit standard-size filing cabinet.

Your Authorized Carboloy Distributor can supply you with the new Carb-O-Lock inserts in Grade 883 now. Call him today.

CARBOLOY®
CEMENTED CARBIDES

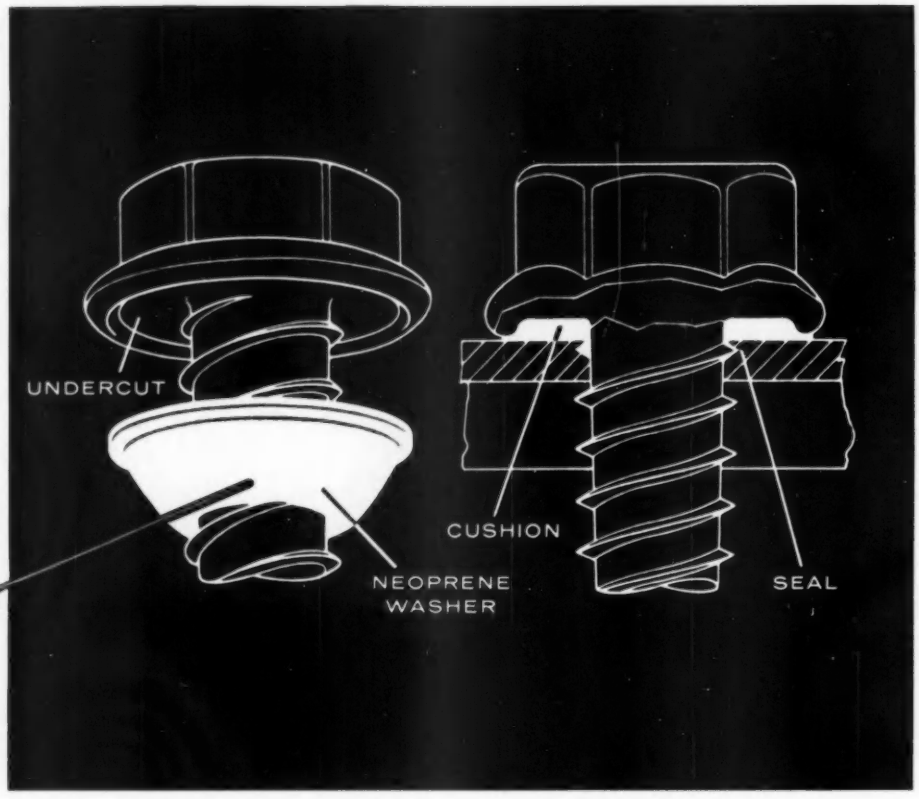
METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMOND • MAGNETIC MATERIALS
THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

ACT NOW!
YOUR SAVINGS BEGIN WITH CARB-O-LOCK!

NAT'S
quick facts
about
Fasteners...



With TUFF-TITE® Fasteners
...it's the cushion control that counts!

You can be very sure of this, in using Tuff-Tite® Cushioned Fasteners.

The preassembled neoprene washer won't ooze off in just any old direction when it's compressed under the head.

It will stay put and do what it's intended to do:

- Form a firm, even cushion under the head
- Seal off the fastener hole
- Prevent fluid leaking past the thread
- Dampen vibration noises around the head
- Protect fine finishes against marring and crazing

. . . because Tuff-Tite's undercut head and tough molded neoprene washer assure consistent cushion control. The undercut confines the spread as the washer is compressed, and the molded shape guides the flow into the top threads, to seal the hole.

It's as simple and as certain as that, for any application requiring fastener sealing and cushioning. Tuff-Tite Fasteners* are available as Machine, Self-Tapping, or Wood Screws, as Stove and Roofing Bolts, and can also be made as Special Fasteners. We'll be glad to work with you on your possible applications.

*More details and specifications on standard types and sizes are given in the Tuff-Tite Fastener folder. Write for your copy.

National PRODUCTS

The National Screw & Mfg. Company • Cleveland 4, Ohio

California Division, The National Screw & Mfg. Company • 3423 South Garfield Avenue, Los Angeles 22, California

NEWS

Vol. 124, No. 12 June 15, 1961

Sales Spurt Continues

Ford Div. Has Best May Total Since 1929

By James Dunne, Detroit Regional Editor, and C. B. Campbell, News Editor

Booming new car sales in the last 10 days of May have continued into June and are expected to remain high throughout the month.

Ford Div. reported its May sales of 177,840 cars and trucks was the highest monthly total in the last two years and the best for May since 1929.

General Motors sales were the highest since last November and Chrysler Corp. reported its daily sales in the last 10 days of May were up 37 per cent over the second 10-day period.

American Motors said the last 10 days of May marked the highest daily sales rate in a year for Rambler. May deliveries of 33,515 were eight per cent above April.

Best May Since 1929

Lee A. Iacocca, Ford vice president and division general manager, said his division's May car sales of 147,115 were best for that month since 1925. The 30,725 trucks sold was an all-time May record.

James M. Roche, GM vice president-distribution staff, said GM sales were 261,219 in May. This was within three per cent of May, 1960, sales. It also marked a 21 per cent increase over April, he declared.

GM dealers' used car stocks are 15 per cent less than a year ago and average a 28-day supply, Mr. Roche said.

"Thus not only our new car sales show a continuing improvement," Mr. Roche added, "but the used car market, always an important barometer in our business, is very strong."

E. C. Quinn, vice president-sales for Chrysler, said May sales of 56,117 were second best this year. April was highest with 69,584 units sold.

Byron J. Nichols, Dodge Div.

AUSTIN HEALY SPRITE RESTYLED

Sweeping changes have been made in the Sprite, the first since its introduction three years ago. The British Motor Corp. claims a top speed of more than 85 mph and 34 mpg. The unitized body has a new hood, fenders, headlights and parking lights. Unlike its predecessor, the hood is separated from the fenders. It has a wheelbase of 80 in. and is 11 ft. four in. long.

←Circle 131 on Inquiry Card for more data

general manager, said his division had a 39 per cent increase in the final 10 days of May, when sales totaled 7453.

51 Pct. Increase Noted

Truck sales, Mr. Nichols reported, increased from 1048 to 1403 a day, a 51 per cent rise in daily rate over the preceding 10-day period. In May, Dodge Div. sold 18,583 cars and 3676 trucks.

Lincoln-Mercury Div. sales of 33,909 for the month were 16 per cent over April and the highest since last October. This figure included sales of English Ford.

Comet sales of 19,238 were the third best since its introduction in March, 1960. Lincoln Continental sales of 2532 were the best for May in five years and 47 per cent over May, 1960.

Cadillac Div. reported May sales of 12,303, or 2.7 per cent higher than for May, 1960. So far this model year, 104,529 Cadillacs have been sold, or 10,000 more than 1960 models for the same period.

Officers Elected

New officers of the Internal Combustion Engine Institute are headed by C. E. Nelson, Jr., president of Waukesha Motors Co.

GM Unit to Coast

General Motors Defense Systems Div. is moving its Land Operations Dept. to Santa Barbara, Calif.

Dr. Harold A. Wilcox, Director of Research and Engineering, has already set up operations in California and will be followed shortly by between 100 and 200 aides.

Remaining at the GM Technical Center at Warren, Mich., are the general manager of Defense Systems, Harold R. Boyer, and the Biological Sciences and Systems Dept., as well as the administrative section.

Auto Tax Credits?

People who buy cars, homes, appliances and other durable goods should receive tax credits in order to provide a boost to employment and the economy, a University of Michigan professor told an Austin, Tex., conference on consumer problems.

George Katona of the University of Michigan Survey Research Center said this type of consumer tax treatment would be similar to President Kennedy's recommended tax incentives for corporations that expand their plants and equipment.

NEW FIAT 1300 OFFERS OPTIONAL ENGINES

Latest model Fiat is available with 79 and 90 cu in. four-cylinder engines developing 72 and 80 hp. Transmission includes four-speed synchronized gearbox and hypoid axle. The engine is carried on sub-assembly combining the suspension and steering linkage.

Spark Plug Agreement

Champion Spark Plug Co has completed negotiations to supply spark plugs to Chrysler Corp. Champion will be the sole supplier of spark plugs for Chrysler's auto, marine and industrial engine divisions.

Champion had been Ford Motor Co.'s sole supplier until Ford's recent acquisition of an Electric Autolite spark plug plant and rights to the "Autolite" name. Autolite had been Chrysler's sole supplier.

Anti-Smog Muffler

A catalyst to control smog-producing gases from automobile engines has been unveiled at Clarksburg, Md., by W. R. Grace & Co. Peter J. Grace, president, said the catalyst will go into special mufflers to reduce the smog-causing hydrocarbons and carbon monoxide.

Before the mufflers could be sold in California they must obtain approval of the state's Motor Vehicle Pollution Control Board.

A major advantage claimed by Mr. Grace for his company's catalyst is that it will work well with gasoline containing lead and other additives.

Contract Talks Slated

General Motors Corp. and the United Auto Workers will begin 1961 contract talks June 28 and the union and American Motors Corp. will open negotiations July 6.

The UAW said earlier it would meet with Chrysler on June 29 and with Ford on June 30.

NEWS

CONTINUED

S-P Truck Contract

Studebaker-Packard Corp. has been awarded a $21.4 million contract to supply heavy duty trucks to the Army.

The contract calls for 3995 two-and-one-half ton 6 x 6 military trucks of the M35A1 series, and includes service parts valued at $967,000. All assembly operations will be at South Bend, Ind. Work probably will begin in December with first deliveries early in 1962.

Engines for the trucks will be produced by Continental Motors Corp., Muskegon, Mich., winner of a $10.7 million contract for 140 hp, six - cylinder multi - fuel power plants. They will operate on kerosene, gasoline, Diesel fuel, JP-4 jet fuel, or a combination of those fuels.

Arctic Vehicle Due

Canada will develop a small, tracked, lightweight vehicle for the U. S. Army. The half-ton high mobility carrier will have a trailer with equal payload. It is expected U. S. companies will participate through sub-contracts on component parts.

Gasoline-powered with a 200-mi range, the unarmored vehicle will be designed for airlift operations. Separated from its trailer, it will be light enough to be carried by helicopter.

Army Orders LARCs

The Army has awarded a $9 million contract to LeTourneau-Westinghouse for 230 all-aluminum LARC amphibians. The five-ton LARC has a water speed of 10 mph and can travel up to 30 mph on land.

The LARC is designed to carry cargo from ships off shore over the beach and inland to supply dumps where no port facilities exist.

It will be powered by a Ford V-8 270 hp industrial gasoline engine. The "off-the-shelf" engine will make it unnecessary for the Army to maintain large stocks of engine parts.

S-P Gets U. S. Order

Studebaker-Packard Corp. has been awarded a $532,351 contract for about 350 Studebaker Larks for various government agencies.

Electric Drive Order

The Siegler Corp. has announced receipt of an army contract for $200,000 for installation of Siegler's new electric drive system in an M-34 vehicle.

The prototype contract was awarded by the Army Ordnance Tank-Automotive Command through the Cleveland Ordnance District.

With the new system, locomotion is accomplished by means of induction traction motors integrally built into each wheel. Alternating current, produced by an engine powered generator and fed to the individual motors through a static frequency changer, operates the motors.

ARMY ORDERS 2½-TON TRUCKS

This is the M-602 six-wheel drive truck, 3976 of which have been ordered from White Motor Co. for $22.4 million. One hundred and four will be fire trucks and 100 will be closed vans. Eight hundred will be long wheel-based cargo trucks. The remainder, 2968, will be open cargo box vehicles.

NEWS

CONTINUED

Auto Show Head

Charles F. Moore, Jr., vice president-public relations, Ford Motor Co., has been elected chairman of the National Automobile Show Committee of the Automobile Manufacturers Association.

He succeeds Charles L. Jacobson who retires soon as vice president-dealer relations, Chrysler Corp. Mr. Jacobson has served on the show committee through the two post-war National Automobile Shows—the 1956 exhibition at the New York Coliseum, and as chairman of the 1960 Show at Detroit's Cobo Hall. E. C. Quinn, vice president-sales divisions, Chrysler Corp., will replace Mr. Jacobson on the committee.

The 44th national show is scheduled for Oct. 20 through 28, 1962, in Cobo Hall.

2 Researchers Named

David M. Borden has been appointed chief engineer-automotive research for Chrysler Corp.'s Engineering Div.

Mr. Borden will direct the Engineering Div.'s gas turbine, piston engine, drive train, chassis and body research activities. His responsibilities also include research design and research mechanical department.

Previously, he was assistant chief engineer for gas turbine research.

The promotion of Ralph H. Isbrandt to vice president-automotive engineering and research, American Motors Corp., was announced by George Romney, president.

Since 1956 Mr. Isbrandt has been director of automotive engineering for American Motors and had been chief design engineer since 1953.

He is a director of the Society of Automotive Engineers.

AMC Purchasing Chief

John C. Secrest, 38, has been elected vice president-purchasing, by directors of American Motors Corp.

He will be responsible for all automotive and appliance purchasing. He will report directly to B. A. Chapman, executive vice president.

Deere Sales Rise

Deere & Co. has reported that sales for the first half of the 1961 fiscal year were 16 per cent higher than a year ago.

Sales for the first six months ending April 30 totaled $273.7 million, compared with $236.8 million a year ago. This year's total was just under the record $277.8 million for the first six months of 1959.

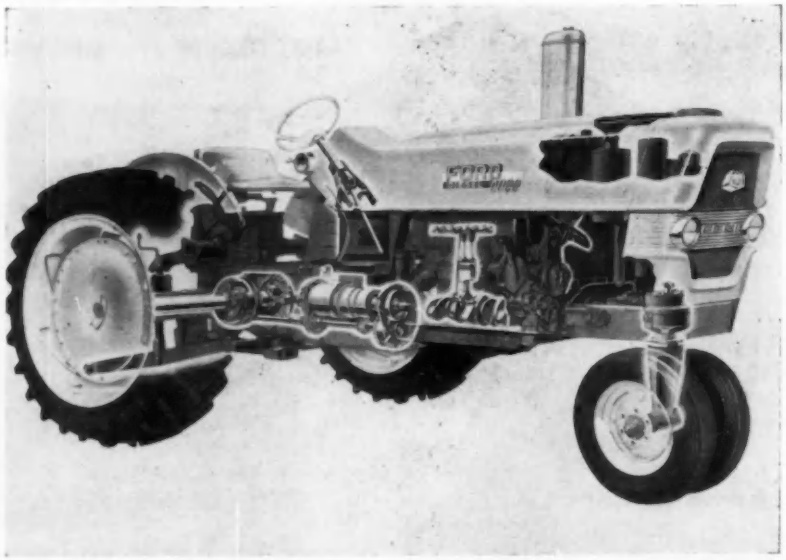
Net income for the same period was $16.9 million, compared with $8.2 million last year, when heavy extraordinary changeover expenses of a new tractor program affected income.

'Multi-Color' Tires

Development of "multi-color" tires was announced by Goodyear Tire and Rubber Co.

Goodyear said the tires will be offered initially with bands of white and blue or white and red on the sidewalls. Other colors may be produced later.

FORD'S NEWEST, MOST POWERFUL TRACTOR



Cut-away drawing shows major features of new Ford 6000 tractor. It delivers 60 drawbar hp and exerts 7000 lb of drawbar pull. A wide range of new implements also have been introduced, including five-bottom plow.

Circle 132 on Inquiry Card for more data ⟶

PERFECT CIRCLE PISTON RINGS ARE INSTALLED AS ORIGINAL FACTORY EQUIPMENT IN 94 BRANDS OF VEHICLES AND ENGINES

Perfect Circle invests more money in piston ring engineering and research than any other ring manufacturer in America. Skilled specialists work with the finest equipment, which is often conceived and built by PC personnel.

Stress testing is one example of PC's superior engineering in action. Each time a new Perfect Circle ring design is created, a model is made 10 times actual size and painted with stress coat. When the model is stressed, the brittle lacquer cracks, revealing the stress pattern of the ring and the accuracy of its design.

PC's engineering leadership, together with the application of intimate knowledge of specific engine requirements, results in rings that deliver a bonus of long-lived high performance. That's why PC rings are the first choice of so many leading vehicle and engine manufacturers the world over.

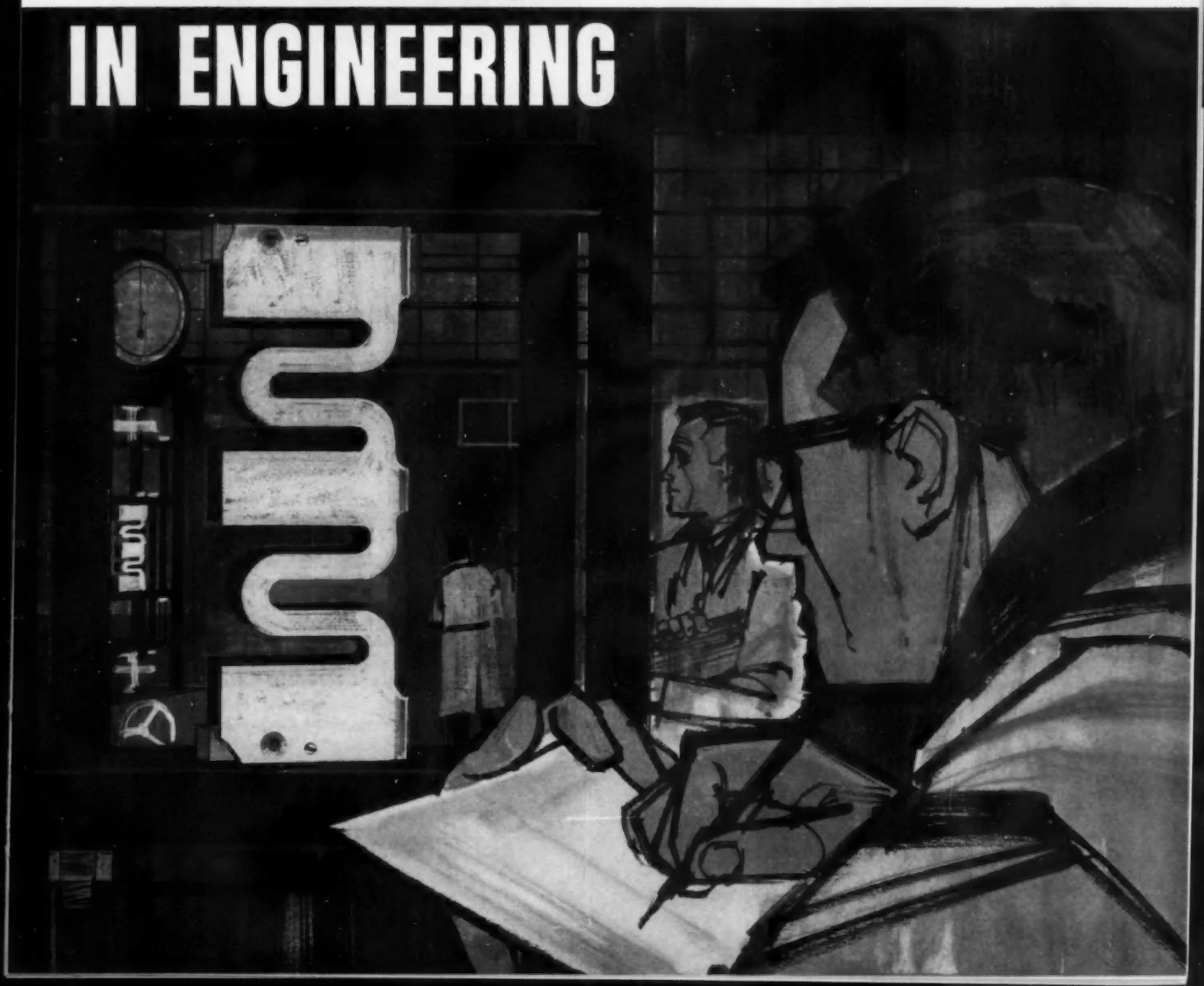
For engineering assistance in solving your engine problems, for the best engineered piston rings money can buy—contact your Perfect Circle representative. As you might expect, he, too, is an engineer.

WHY THE "PROS" PREFER PERFECT CIRCLE PISTON RINGS:

PC IS FIRST IN ENGINEERING

PERFECT CIRCLE

PISTON RINGS • PRECISION CASTINGS • SPEEDOSTAT • ELECTRONIC PROGRAMING EQUIPMENT
Hagerstown, Indiana Don Mills, Ontario, Canada



Helping to make tomorrow's cars today . . .

Progress report on 4 high

NEW FROM BUDD—an advanced concept in the testing and design of automobile bodies brings road and proving ground *into* the laboratory. Shown here is part of an extensive, Budd-developed instrumentation system that can simulate hundreds of thousands of miles of travel, under the most rigorous conditions, in one-third actual road or proving ground time. In addition to providing quicker answers, laboratory environment permits easier, more accurate evaluation of results. New procedure is readily applicable to any automobile—can effect substantial savings in time and costs in the efficient design of new bodies.

A BUDD TECHNICIAN TESTS the application of adhesive for the bonding of automobile door components. As yet not widely used in the automotive field, adhesive bonding holds great promise for increasing flexibility in the manufacturing process—broadening choice of materials, such as aluminum and steel combinations, newly developed plastics, etc. In helping to overcome current problems, Budd research opens up a new method for producing a better product more efficiently and economically.

"AUTOPIA" a new sound film in color—tells the complete story of our automotive facilities. If you are interested in seeing this film, write on your company letterhead to Sales Department, Automotive Division, The Budd Company, Detroit 15.

The research projects reported here are but four of many currently underway at Budd that offer a high potential for the entire automotive industry. Objectives—to improve manufacturing procedures . . . increase quality . . . lower costs. As one of the largest independent automotive suppliers in the world, Budd has always sought new ways to provide better products. Past Budd research has paid off in such diverse areas as the all-steel body and current techniques of resistance welding used throughout the automotive industry. Such research is but one of the many ways Budd serves the automotive industry in helping "to make tomorrow's cars today."

potential research programs

Budd Automotive

DETROIT • MICHIGAN

AN INSTRUMENTED STUDY ON SPOT WELDING galvanized steel—one phase of a Budd research program to investigate the fabrication of galvanized steel by the automotive industry. Preliminary results of other Budd studies indicate that many automobile structural members can be formed from galvanized steel—using the same dies employed for regular uncoated steel. Research of this kind will eventually lead to the mass produced, completely corrosion resistant cars of the future.

ULTRA-HIGH-SPEED PHOTOGRAPHY OF ARC WELDING PROCESS—part of Budd's study of new arc welding techniques, processes and equipment in order to broaden the knowledge of these methods in automobile body fabrication. A major objective—to exercise complete control of these processes as applied to high production quality welding. Eventual benefits to the industry will include greater fatigue resistance, savings on weight, reduction of rejects, much higher corrosion resistance.

Circle 133 on Inquiry Card for more data

Ross Model S10 steering . . . 8:12:8 variable ratio, 2.1 turns lock to lock. Aluminum components.

I have Ross variable-ratio steering, too!

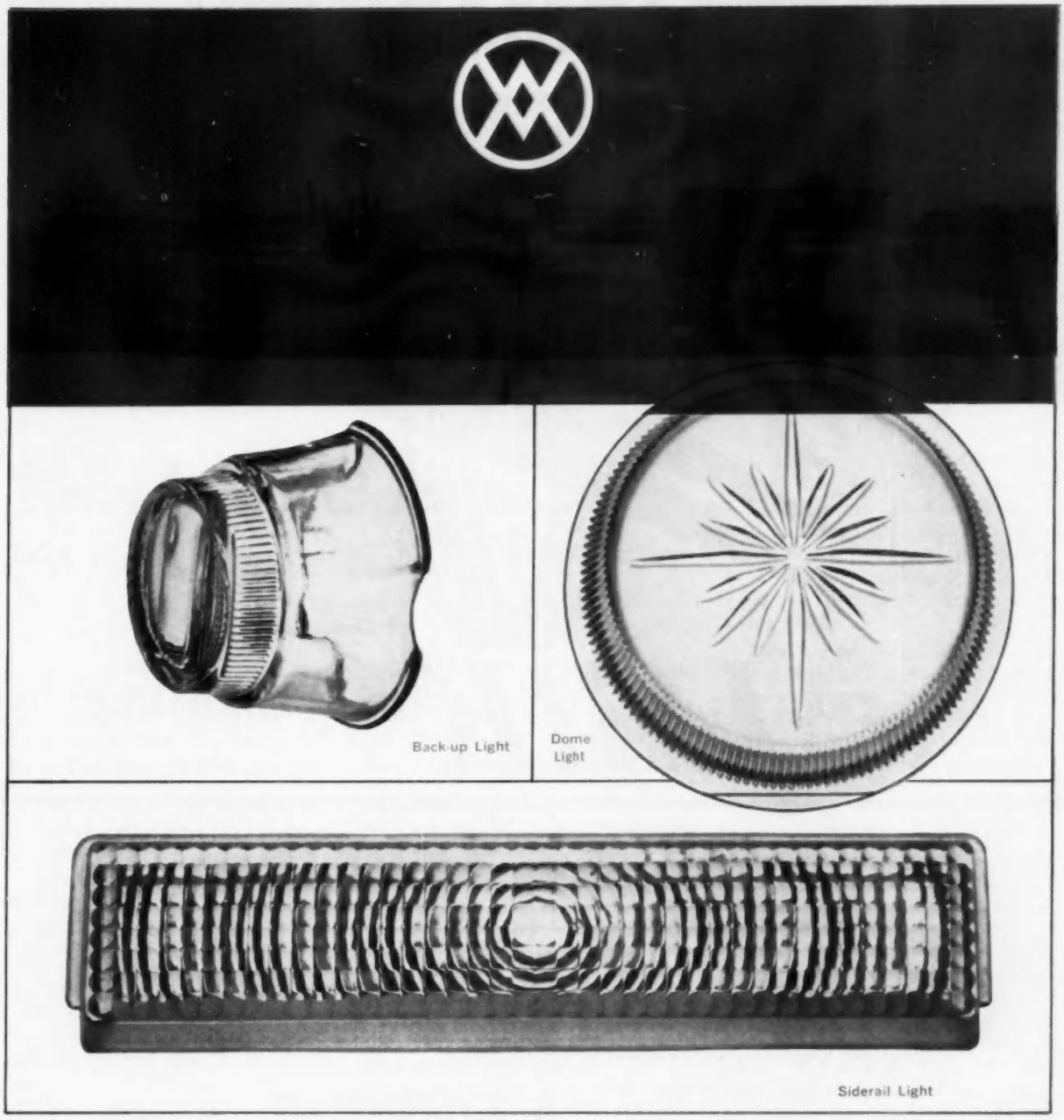
"With automotive-type steering, my golf car maneuvers like a sports car.

"And since it has a Ross *variable-ratio* gear, I get faster steering and quicker recovery for turns, and slower steering and greater stability for straight-ahead handling. Much *steadier* and *safer* for hilly terrain!" Ross makes a gear for every steering need—manual or power, constant or variable ratio. Ross invites *your* inquiry.

Ross **STEERING**

ROSS GEAR & TOOL COMPANY, INC.
Ross Division, Lafayette, Indiana • Gemmer Division, Detroit, Michigan

Circle 134 on Inquiry Card for more data



Detroit builds the cars...
Lancaster engineers the glass

Modern American cars call for components of uniform high quality—at competitive cost. That's why leading automotive manufacturers depend on Lancaster to produce such glass parts as the interior and exterior light lenses shown above. Lancaster provides engineering assistance in the planning stages, then follows through with mass production and prompt delivery. Need a glass component? Send blueprints for quotations or write for further details.

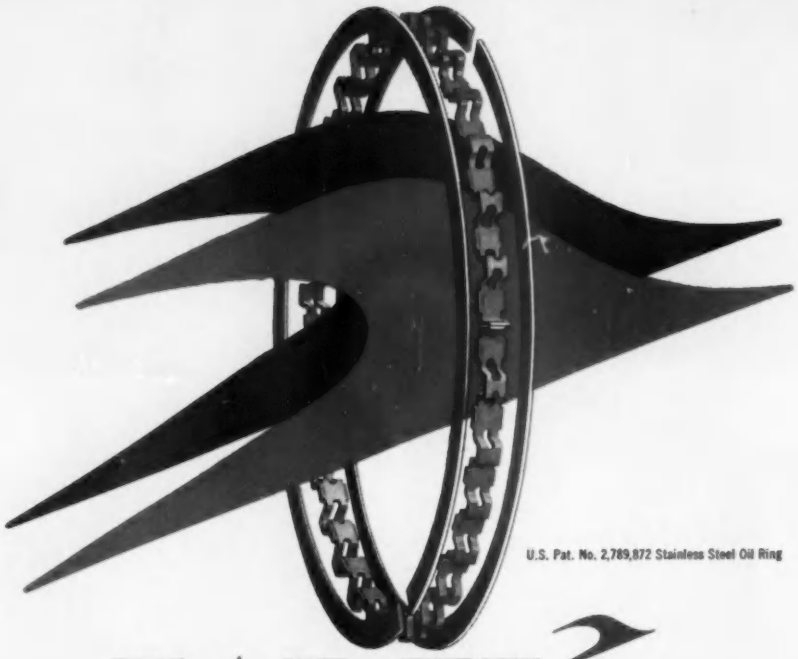
This mark means glass, engineered by Lancaster

Lancaster

LANCASTER GLASS CORPORATION, LANCASTER 5, OHIO

Circle 135 on Inquiry Card for more data

PERFORMABILITY



U.S. Pat. No. 2,789,872 Stainless Steel Oil Ring

THE LARK BY STUDEBAKER

KromeX by Sealed Power

with Stainless Steel Oil Rings

TESTED AND APPROVED

for all Studebaker Packard KromeX replacement sets

Sealed Power

KromeX piston ring sets with Stainless Steel oil rings* deliver unmatched oil control and last longer for these 5 reasons—

1. Easy to install
2. Seat instantly
3. Hold their fit in the cylinder
4. Maintain their original tension
5. Chrome-plated side rails for extra life

For outstanding performance, every KromeX set also has chrome-plated top compression rings.

- **Positive blow-by control**
- **Factory-lapped for instant seating**
- **Long Life**

*Manufactured by Sealed Power Corporation, Muskegon, Michigan

S-P
SUPERIOR PERFORMANCE Guaranteed

PRECISION BUILT PRODUCTS

Parts and Service Division

STUDEBAKER-PACKARD CORPORATION

SOUTH BEND 27, INDIANA AND ZONES

Circle 136 on Inquiry Card for more data

NEWS

FEATURES

Tires Again Decide '500'

Foyt Victor Over Sachs by 8.28 Seconds

By Bill Smyth,
Racing Editor

For years it has been the custom at the Indianapolis Speedway to refer to each 500-mi race as the greatest ever run. But after the sizzling duel between Rodger Ward and Jim Rathmann in 1960, many were ready to admit it would be nearly impossible to top that one.

However, the "golden anniversary" event on May 30 was equal to the preceding year in thrills, excitement, and suspense. Following a similar format, the 1961 race had fans and racing personnel breathless at the finish.

A 26-year-old Texan, A. J. Foyt, of Houston, took the top prize of more than $117,000 and numerous other trophies and mementoes such as the Thunderbird pace car. His victory came after fate had flitted about like a fickle schoolgirl.

2 Unscheduled Stops

Second, 8.28 seconds behind Foyt was loquacious Eddie Sachs, of Centre Valley, Pa., who drove the greatest race of his career and came within a whisker of winning.

The finish was rather ironic as two miscalculations offset each other when both Foyt and Sachs made unscheduled pit stops near the end.

Foyt, in the Bowes Seal Fast Special, and Sachs, in the Dean Van Lines Special, were the two survivors from a pack of about eight drivers who started dueling from the beginning. From the halfway point on, it was a two-man race with Ward, 1959 winner, tagging about 15 seconds behind. Ward was in contention until the last few laps, but could not make up ground and eventually fell some distance behind Foyt and Sachs.

Wheel to Wheel

But that pair were wheel to wheel for nearly 200 mi. The lead was traded back and forth until Sachs made his third and what was supposed to be his last pit stop on the 158th lap of the 200-lap event. This was a routine stop for fresh tires and fuel, and although his crew was not sensational, the stop was recorded in 27 seconds.

Foyt came into the pits three laps later for the same reasons. The tire changes were made smoothly, but the aircraft type fueling rig failed to function and his fuel supply was not replenished. The crew could not get the valve, which releases the fuel, turned on. They tinkered for an instant and then decided to send Foyt back out to run several laps while they sought a solution.

Foyt lost four seconds in the pits, but since he was light on fuel, he quickly made up the difference and passed Sachs on the 170th lap. He proceeded to move away and eventually had a five-second lead.

Most spectators thought he would win easily, but they were unaware he was short on fuel and would have to stop again. As a matter of fact, Foyt himself did not know. His crew decided not to tell him, feeling he might become discouraged.

Meanwhile, the crew, led by George Bignotti, chief mechanic, had borrowed another fueling apparatus and was ready to receive Foyt. The latter learned of his lack of fuel about 10 laps later when his engine began to miss, and he made his fourth stop on the 185th lap. Although it took only 17 seconds, Sachs took a lead of about 30 seconds with only 15 laps left. There appeared to be no chance for Foyt to overtake Sachs, and spectators and mechanics were certain now that Sachs would win.

Rear Tire Wears

Again, there were unknown forces at work. Sachs had been getting about 50 laps on a set of tires. Since he had made his last stop on the 158th lap, his crew chief, Clint Brawner, reasoned he would finish with ease. What Sachs and Brawner didn't realize was that Sachs, with a full fuel load, had been racing Foyt, who had

(*Turn to page* 51, *please*)

AI TABLOID

The relationships of temperature, electrical resistance, and thermal expansion for metals and semiconductors are studied in one of three U. S. government research reports. The two other reports are on indium antimonide for semiconductors, and the response of photomultiplier tubes.

* * *

Russian research on air pollution and other health hazards in industry, results of Soviet efforts to eliminate respiratory diseases endemic to certain occupations and proposals for improving factory working conditions through better sanitation, are among subjects reviewed in a U. S. Public Health Service-sponsored survey.

* * *

The tensile and notch tensile properties of four refractory metals are investigated in one of four Air Force metals research reports released to industry and the public. The three other reports are on the effects of high pressure and temperature on various elements and binary alloys; the mechanical properties of aircraft structural metallic materials; and fatigue and stress rupture in Inconel and titanium alloys.

* * *

Cooling systems for space ships are investigated in an Air Force research report released to science and industry.

* * *

Evaluation of a two-rotor gyroscope as a precision direction-sensing device in missile guidance and space navigation is described in an Air Force research report.

* * *

Polyvinyl chloride resin is finding important uses in the building industry in such forms as panels, waste piping, leaders and gutters.

* * *

A very little platinum attached to tantalum metal equipment inhibits the hydrogen embrittlement of the latter metal that now plagues users of tantalum chemical equipment.

Methods of melting and casting the refractory metals molybdenum, columbium, tantalum, and tungsten are described in one of two reports released to industry and the public. The other report is an analysis of the tensile properties of heat-treated titanium alloy sheet metal.

* * *

An experiment to produce selected crystals in the refractory hard metals class for mechanical and other property determinations is described in an Air Force research report.

* * *

Negative ions released into the air by a newly perfected unit employing tritium (radioactive isotope of hydrogen) are expected to relieve us from symptoms of colds and other respiratory disorders.

* * *

Two new selective bibliographies listing U. S. government research reports, translations, and other technical documents on high temperature metallurgy and heat resistant alloys, and heat treatment of metals have been published by the Office of Technical Services, Business and Defense Services Administration, U. S. Dept. of Commerce.

* * *

An improved flux for core solder based on a wide range of metals and yields solid joints without acidic, hygroscopic, corrosive or fungus-promoting residue.

* * *

The newest method of fabricating employs a blowing technique to form packages of polyethylene resin that will withstand corrosives and pressure.

* * *

A new device to foil forgers of signatures employs the optical properties of the fibers of the paper to scramble passbook signatures for record and unscramble them later, thus giving the forger no legible original to copy.

Frank Walter, 38, who has been appointed director of product planning and chief engineer of the Plymouth Div. of Chrysler Corp.

$4400 Mexican Limit

Mexico has barred importation, assembly or sale of automobiles with price tags of more than $4400. This eliminates most eight-cylinder models.

The latest government restrictions have resulted in 14 European makes being withdrawn from the Mexico City market, plus 19 models of other manufacturers. The Industry and Commerce Ministry said 43 makes and 117 types of cars will shrink soon to 29 makes with 69 models. New government - controlled prices also were announced, with cuts for most models ranging up to 27 per cent.

Ford, Chrysler and Datsun have presented plans for Mexican manufacture and other companies are known to be preparing similar proposals. The government, however, has made no commitments.

(*Continued from page* 49)
little fuel, and at speeds in excess of 147 mph. As a consequence, Sachs got poor tire wear and at 194 laps, he began to see the white cord in his right rear tire, a telltale sign the tire was about gone.

Sachs continued through the 197th lap, but finally had to stop for a tire change. This stop also was fast, but it put the two leaders back in the same relative positions before their troubles began. With an eight-second lead, Foyt became the winner.

His car, built by Floyd Trevis, of Youngstown, O., is almost an exact copy of the cars built by A. J. Watson, of Glendale, Calif. Watson cars have won three of the last five races.

Foyt's winning speed of 139.130 mph was almost a half mile an hour faster than the 1960 record set by Rathmann.

Nine Cars by Watson

The cars in this year's race presented an interesting variety of ideas. Watson was represented by nine creations. In additon, five more cars were patterened after his basic plans. Quinn Epperly had five cars in the starting lineup and Frank Kurtis built four. Trevis and Eddie Kuzma each made three contributions.

Eleven cars had laydown engines, while the rest, including the winner, had their engines in an upright or semi-upright position.

For the first time in nine years, a foreign driver was in the field. Jack Brabham, of Australia, world road racing champion, drove a Cooper Climax. It is powered by a 168 cu in. rear-mounted Coventry Climax engine.

Brabham astounded the American racers with his speed in the turns, but was short on acceleration down the straightways. He got bogged down in traffic in the turns and did not have the brute horsepower of the 255 cu in. Offy engines to boom off the turns.

It is suspected that owner John Cooper has some ideas about a stronger power plant for next year. If he can find more punch and still maintain the proper balance to get the same tremendous handling, his car will be troublesome for the American entrants.

Others in the first 10, their elapsed time and average speed were 3, Rodger Ward, 3:36, 138.539; 4, Clark Templeman, 3:39, 136.873; 5, Al Keller, 3:40, 136.034; 6, Chuck Stevenson, 3:41, 135.742:7, Bobby Marshman, 3:41, 135.534; 8, Lloyd Ruby, 3:42, 134.116; 9, Jack Brabham, 3:43, 134.116; 10, Norman Hall, 3:43, 134.104.

TANK DRIVING BY TELEVISION

Medium tank with television equipment is tested at Human Engineering Laboratories, Aberdeen Proving Ground, Md., for use on atomic battlefield. In combat, the cameras and power system mounted atop the tank would be inside the armored vehicle. At present, tank drivers are supine while driving.

New Rubber Process

Goodyear Tire & Rubber Co. revealed it has a new method of making synthetic rubber at less than present natural rubber prices.

The key, Goodyear said, is a new process for making isoprene, a basic material in the manufacture of its Natsyn rubber. The process will make possible the manufacture of such rubber at 25 cents a lb. Goodyear officials said. Natural rubber has been selling at from 32½ cents a lb to 28 cents in recent months.

EUROPEAN ROUND-UP

By DAVID SCOTT • Special Correspondent

English Ford's new Consul 315 highlights the company's policy of broadening its range of models with minimum tooling costs. It uses the cylinder block of the exceptionally over-square Anglia engine with a longer-throw crankshaft that increases the stroke from 1.9 to 2.5 in. and displacement from 60.84 to 81.78 cu in. with the same 3.18-in. bore.

Capacity could be further increased to 102 cu in. while still keeping the unit square, and such an engine may be used in a future Ford model. In addition, clutch, transmission and rear axle are common to the Anglia and Consul 315.

The Selwood rotary cylinder engine was viewed by engineers from Ford, Rootes, Rover, M.G., Rolls-Royce and Bristol-Siddeley who attended a private demonstration at Southampton, England, last month.

Harry Ferguson Research has leaked out a few details about its experimental Grand Prix car which may be raced later this season. It has four-wheel drive with special differentials that are said to equalize torque under all conditions and reduce wheelspin. Suspension is all-independent with inboard disk brakes. Engine is a front-mounted 1½-liter Coventry Climax, but a Climax V-8 of the same capacity may be fitted when this appears next year.

Volkswagen is releasing driblets of information on the new VW 1500 prior to its public display at the Frankfurt Show in September. The 91-cu in. engine of unusually flat design is stowed beneath the tail compartment, giving considerable luggage space in the rear as well as the forward trunk. Built on a 7-ft 10½-in. wheelbase, the body is just under 14 ft long, and construction of the platform chassis and suspension is similar to that on the existing car.

Daimler-Benz has developed a compact tuned induction system claimed to give the charging efficiency of a lengthy induction pipe. The simple manifold consists of a D-section main intake pipe, with outlets to the individual cylinders joining it at the flat face. The resultant harnessing of oscillations in the air column provides a substantial power gain over the selected speed range.

New German Brake

Another new design from Germany is a transmission disk brake in which the friction pads are applied by steel balls rolling on inclined planes. Ramps are carried on a ring with a toothed segment engaged by an air- or hydraulically-operated rack for brake actuation.

In Britain, Servais Silencers has produced a corrosion-resistant muffler employing mild steel processed with a metal treatment that gives a protective layer of 60 per cent chrome alloy. The "Interchrome" process is stated to be more akin to carburizing than to plating, and to provide the durability of stainless at a lower cost and without the machining difficulties.

Electronic Highway

The British government's Road Research Laboratory has started a program for developing an electronic guidance system for road vehicles, using sensing coils and buried signal wires for controlling steering, braking and other functions. Long-term aim is an electronic expressway with the traffic capacity of a railroad.

B. O. Morris has devised a method of accurate observation of hard-to-see work areas during boring, grinding and other machining operations. A miniature transducer detects vibrations excited by tool contact, and these are displayed on an oscilloscope.

Rolls-Royce Hit

Rolls-Royce has been hit by Britain's 1961 budget proposal to limit income tax allowance on company cars to £2000 ($5600) retail price. Cheapest Rolls costs $17,000 in the United Kingdom and the factory at Crewe, with a number of canceled orders from expense-account customers, is faced with a production cut-back.

Leyland's take-over of Standard-Triumph is now formalized, and the two companies are studying the integration of their distribution and export networks, and their dovetailing production programs of heavy trucks and buses, and light delivery vans and cars. A practical Diesel car may be one of the offsprings of the marriage.

Newest European link aimed at exploiting Common Market possibilities is between Henschel of Germany and Saviem (Renault subsidiary), who have signed a 25-year agreement covering the manufacture and marketing of trucks and buses. Their two ranges are complementary, and existing sales and service channels and organizations will be shared by both firms.

INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

WEEKLY U.S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending May 27	Weeks Ending May 20	Year to Date 1961	Year to Date 1960
PASSENGER CAR PRODUCTION				
Total—American Motors	8,969	9,175	138,285	224,007
Chrysler	2,064	1,939	37,352	40,360
De Soto	.....	.....	.....	14,753
Dodge	4,229	2,932	52,769	189,249
Imperial	133	66	2,977	7,534
Lancer	1,015	710	17,110	.....
Plymouth	4,839	3,409	69,557	125,574
Valiant	3,362	2,466	46,988	122,077
Total—Chrysler Corp.	15,642	11,522	226,751	499,547
Comet	4,805	4,636	66,725	55,484
Falcon	13,806	13,509	194,814	216,450
Ford	20,945	19,565	334,585	488,392
Lincoln	525	494	13,076	10,028
Mercury	2,425	2,236	40,426	79,671
Total—Ford Motor Co.	42,507	40,440	649,628	850,025
Buick	4,218	3,314	71,277	136,544
Buick Special	2,574	2,269	31,715	.....
Cadillac	2,703	3,353	68,925	74,787
Chevrolet	27,814	31,218	518,305	807,779
Corvair	7,839	7,952	147,048	131,548
Oldsmobile	5,288	4,105	94,635	180,254
Oldsmobile F-85	1,324	1,317	28,695	.....
Pontiac	5,885	4,541	93,354	212,156
Tempest	2,872	2,835	50,204	.....
Total—General Motors Corp.	60,515	60,904	1,102,158	1,543,068
Total—Studebaker-Packard Corp.	1,508	1,488	24,651	53,214
Checker Motors	128	124	2,476	3,374
Total—Passenger Cars	129,269	123,653	2,143,949	3,173,535
TRUCK AND BUS PRODUCTION				
Chevrolet	7,805	7,987	138,616	205,616
G. M. C.	1,728	1,371	28,216	49,876
Diamond T	34	37	700	1,283
Divco	60	60	992	1,932
Dodge and Fargo	1,639	1,526	27,011	34,653
Ford	7,308	7,318	140,811	166,053
F. W. D.	11	17	361	470
International	3,472	3,123	60,190	58,422
Mack	202	197	4,041	6,252
Studebaker	214	238	3,269	6,636
White	396	382	7,139	8,257
Willys	1,924	2,156	43,894	63,577
Other Trucks	80	80	1,600	2,158
Total—Trucks	24,873	24,492	456,840	605,185
Buses	63	83	1,547	1,717
Total—Motor Vehicles	154,205	148,228	2,602,336	3,780,437

1961 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	March	Three Months 1961	Three Months 1960
Vans			
Insulated and refrigerated	505	1,292	1,688
Steel	77	154	282
Aluminum	428	1,138	1,406
Furniture	126	260	519
Steel	104	225	463
Aluminum	22	35	56
All other closed-top	1,702	4,049	8,565
Steel	372	854	1,844
Aluminum	1,330	3,195	6,721
Open-top	204	538	912
Steel	62	146	285
Aluminum	142	392	627
Total—Vans	2,537	6,139	11,684
Tanks			
Non- and low-pressure			
Petroleum and aircraft refuelers			
Carbon and alloy steel	102	226	476
Stainless steel	16	48	74
Aluminum	89	292	494
Total—Petroleum	207	566	1,044
Chemical, food, and sanitary	49	136	159
Dry materials	164	238	330
High-pressure (LPG, chemicals, etc.)	24	112	82
Total—Tanks	444	1,052	1,615
Pole, pipe, and logging			
Single axle	19	135	62
Tandem axle	46		226
Total	65	135	288
Platforms			
Racks, livestock, and stake	24	82	74
Grain bodies	61	175	473
Flats, all types	453	1,157	2,856
Total—Platforms	538	1,414	3,403
Low-bed heavy haulers	258	656	540
Dump trailers	123	364	372
All other trailers	346	795	951
Total—Complete Trailers	4,311	10,555	18,853
Dump trailer chassis[1]	42	82	241
Trailer chassis only[1]	208	635	879
Total—Trailers and Chassis	4,561	11,272	19,973
Detachable van bodies[1]	244	757	639

[1] Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS*

Zone	Region	March 1961	February 1961	March 1960	Three Months 1961	Three Months 1960	Per Cent Change: March over February	Per Cent Change: March over March 1960	Per Cent Change: 3 Months 1961 over 1960
1	New England	27,020	18,904	30,048	65,911	75,496	+42.93	−10.08	−12.70
2	Middle Atlantic	106,873	63,852	109,628	253,022	278,553	+67.38	− 2.51	− 9.17
3	South Atlantic	66,642	51,542	78,519	184,154	208,622	+29.30	−15.13	−11.73
4	East North Central	107,747	83,901	151,655	278,125	387,881	+28.42	−28.95	−28.30
5	East South Central	22,528	16,572	31,321	56,881	75,465	+35.94	−28.07	−24.63
6	West North Central	37,940	32,474	50,438	105,508	123,362	+16.52	−24.98	−14.47
7	West South Central	35,498	36,418	50,453	108,849	127,811	− 2.53	−29.64	−14.84
8	Mountain	18,244	13,346	19,201	47,778	50,879	+36.70	− 4.98	− 6.09
9	Pacific	57,675	57,868	75,406	168,279	192,892	− .33	−23.51	−12.76
	Total—United States	480,067	374,877	596,669	1,268,507	1,520,963	+28.06	−19.54	−16.60

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., H. I., Ore., Wash.

1961 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	33,000 lb. and over	Total
January	45,034	13,754	816	1,782	9,023	4,628	1,911	2,091	79,039
February	49,549	14,423	739	2,304	9,667	4,408	1,712	2,019	84,821
March	56,360	15,522	1,076	2,902	12,778	5,820	2,145	3,306	99,909
Total—Three Months—1961	150,943	43,699	2,631	6,988	31,468	14,856	5,768	7,416	263,769
Total—Three Months—1960	203,679	56,758	3,747	9,305	53,754	20,834	10,805	10,037	368,919

WHITE makes the truck *

BURTON makes the spring

* The all new **WHITE P. D. Q.** multi-stop fiberglass body truck. No possibility of rust or corrosion, inside or out, with the fiberglass "sandwich type" construction of the load compartment of the next White P.D.Q. (Pickup, Deliver, Quick) truck. This is the newest addition to White's multi-stop vehicle line and features a new concept in load compartment insulation and increased load capacity. We at Burton have a great sense of satisfaction in being the supplier for the springs for this new White line of trucks.

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Since 1923 we have manufactured automotive springs exclusively

MEN IN THE NEWS

Warner Electric Brake & Clutch Co.—Edwin J. Newberg has been named chief industrial engineer.

Ford Motor Co.—Steel Div.—C. William Conn has been promoted to general manager.

Budd Co., Automotive Div.—Roy C. Norton, Jr., has been named excutive engineer-customer service.

Metal & Thermit Corp.—Earl J. Conway has been named a coatings specialist.

United States Rubber Co., Footwear and General Products Div.—Forrest E. Palmer has been appointed manager of automotive sales.

Zollner Corp.—Gene Cormany (far left) has been named vice president—engineering and C. Edward Johnson has been named executive engineer.

Motor Wheel Corp.—**William G. Curott** has been elected treasurer.

Clark Equipment Co.—**Walter E. Schirmer** has been named executive vice president.

Cone Automatic Machine Co.—**J. Arnold Kiely** has been appointed executive vice president and **Robert R. Rhodehamel** has been named vice president-manufacturing.

Motec Industries, Inc., Engineering and Research Div.—**David E. Thorn** has been appointed materials engineer.

Electric Autolite Co.—**Earl R. Fiene** has been promoted to vice president and director of sales.

Standard-Thomson Corp., Automotive Div.—**John H. Graves** has been named assistant to the division manager.

Continental-Diamond Fibre Corp.—**Robert S. Handly** has been named vice president-manufacturing and **Worth Tracy** has been promoted to vice president-employee relations.

Michigan Seamless Tube Co.—**Melvin F. House** has been appointed production manager.

Bendix Corp.—**Dr. Albert B. Van Rennes** has been appointed director for European scientific and technical liaison.

Udylite Corp.—**Robert C. Trees** has been named vice president-marketing.

Hughes Aircraft Co.—**Thomas E. Piper** has been named manager of materials and process department.

General Motors Corp.—**Thomas C. Van Degrift** has retired as head of the Research Laboratories Special Problems Dept.

Bendix Corp., Filter Div.—**John R. Baker** has been named quality control manager.

American Brake Shoe Co., Denison Engineering Div.—**Kenneth C. Harris** has been promoted to manager of marketing research.

United States Rubber Co.—**Robert L. LaBelle** has been appointed sales manager of automotive Koylon foam.

General Motors Corp., Delco-Remy Div.—**J. H. Bolles** has retired after 41 years' service.

Young Spring & Wire Corp—**Joseph C. Miller** has been appointed comptroller of the Automotive Div. and **John A. Anderson** has been named Chicago plant manager.

Highway Trailer Industries, Inc.—**Arthur C. Siegel** has been named director of purchasing.

Ford Motor Co. of Canada—**A. C. Moore** has been promoted to vice president-manufacturing.

Heald Machine Co.—**G. Harding Allen** has been promoted to works manager.

Goodyear Tire & Rubber Co.—**Dr. Ray P. Dinsmore** has retired as chief of research and development.

General Motors Corp., Cadillac Div.—**Edward Andrews** has been promoted to coordinator of special assignments and **Robert D. Herley** has been named assistant works manager.

Landis Machine Co.—**D. E. Stoner** has been promoted to works manager and **R. D. Helm** has been named secretary-assistant treasurer.

Necrology

Raymond R. Rausch, 67, retired executive vice president and director of the Ford Motor Co., died May 20 in Pontiac, Mich.

Max F. Richter, 56, vice president and manager of the R. C. Mahon Co. Steel Warehouse Div., died May 18 in Livonia, Mich.

Harold L. Smith, 71, former assistant to the treasurer of General Motors Corp. and Cadillac Motor Div. executive, died May 17 in Detroit.

Henry R. Krueger, 73, inventor and machine tool mass production expert, died May 16 in Detroit.

Henry K. Holsman, 94, pioneer automobile manufacturer, died May 15 in Genoa City, Wis.

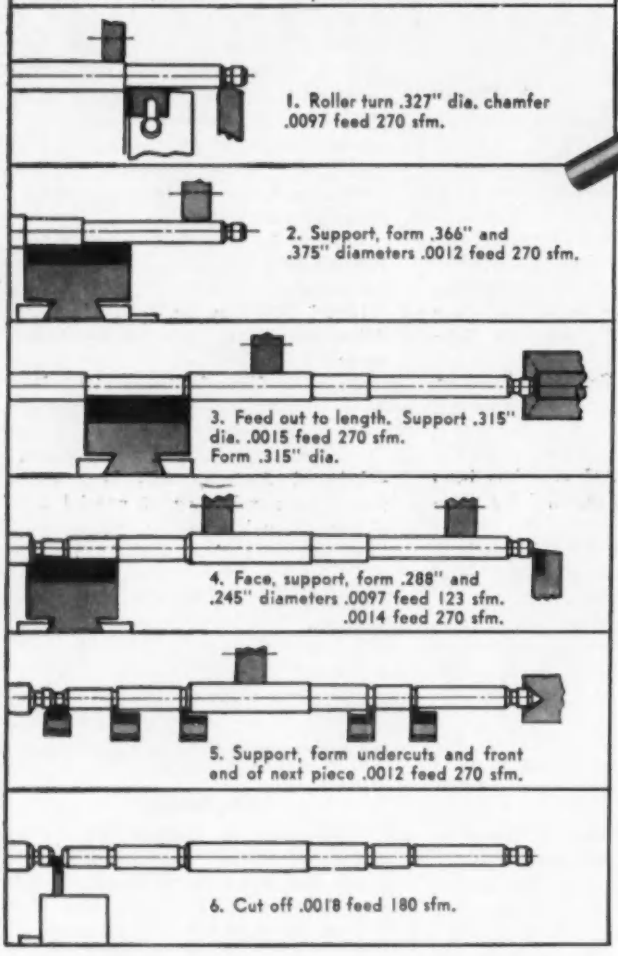
Robert S. Plexico, 63, retired chief truck designer for the Chevrolet Motor Div. of General Motors Corp., died May 10 in Istanbul, Turkey.

←——Circle 137 on Inquiry Card for more data

GREENLEE AIR-FEED AUTOMATICS BENEFIT "ELECTROLUX" FOUR WAYS . . .

MACHINE . . . 1"-6 Automatic Bar Machine Air-Feed — Feedout on index and in 3rd position during machine cycle.
TOOLING . . . Carbide Tipped
MATERIAL . . . 1137
STOCK SIZE . . . 13/32" rd.

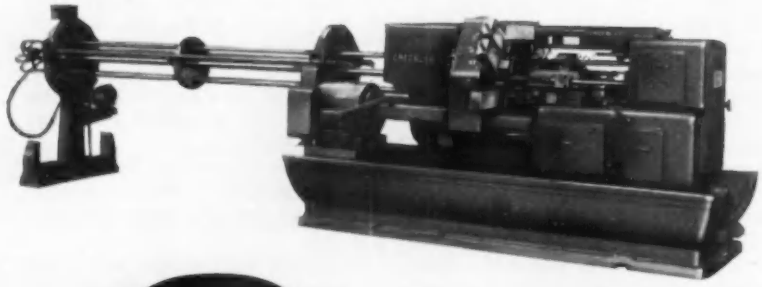
TOOL SLIDE STROKE . . 1-9/16" at .0097" feed.
SPINDLE SPEED . . . 2540 rpm 270 sfm.
MACHINE TIME . . . 5.8 seconds.
ESTIMATED GROSS PRODUCTION . . . 620 per hour


1. Roller turn .327" dia. chamfer .0097 feed 270 sfm.
2. Support, form .366" and .375" diameters .0012 feed 270 sfm.
3. Feed out to length. Support .315" dia. .0015 feed 270 sfm. Form .315" dia.
4. Face, support, form .288" and .245" diameters .0097 feed 123 sfm. .0014 feed 270 sfm.
5. Support, form undercuts and front end of next piece .0012 feed 270 sfm.
6. Cut off .0018 feed 180 sfm.

1. Eliminate stock pushers . . .
2. Eliminate scoring of stock . . .
3. Reduce downtime during set-up . . .
4. Provide extra length feed-out . . .

The part is a 6-7/8" long armature shaft used in the "Electrolux" vacuum cleaner. It demonstrates how effectively Greenlee Air-Feed Automatics and carbide tooling can team-up to increase production and reduce costs. The shaft is machined from 13/32" S.A.E. 1137 steel at a gross production rate of 620 pieces per hour. Recommended cutting speed for high speed tooling is 120 sfm. The rate was boosted to 270 sfm with carbide-tipped tooling. Sequence of operations is shown at the left.

Note how the stock is partially fed out on the index and to its full length in the third position This provides for the most effective tooling arrangement. Greenlee Air-Feed Automatics permit greater job versatility and assure added profits. See your Greenlee representative or send us a print of your high-cost problem-part.



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an Editorial

Meeting the Challenge of Modern Mobility

THE TASK OF SUCCESSFULLY MEETING the challenge of improvement of mobility is an activity which has held top priority in modern industry at home and abroad for decades. In the fulfillment of such tasks, American automotive designers have provided much of the leadership which has been responsible for better and lower-cost transportation. Now the scope of this challenge is vastly extended. More people and more products must be moved more miles in future years. Obviously, the duties and responsibilities of automotive designers have substantially increased. Further increases in responsibilities loom up ahead, as the completion of super-highway networks link larger distances and greater geographic areas year by year. Higher operating speeds must be joined with increased safety, comfort, economy and convenience. The responsibilities for achieving these gains are assigned specifically to the designers of the vehicles of the future.

MAJOR MANUFACTURERS THROUGHOUT the 6500 plants which supply materials, components, parts, sub-assemblies and complete vehicles in the United States have significantly recognized the importance of design functions. Staffs have been increased in size. More and better facilities have been added. Budgets for operations have expanded decade by decade. Further expansions now can be foreseen. The status of the design function is symbolized in corporate organizations by officers at top executive levels. Reports of progress in research and development are included in summaries of corporate programs included in annual financial reports.

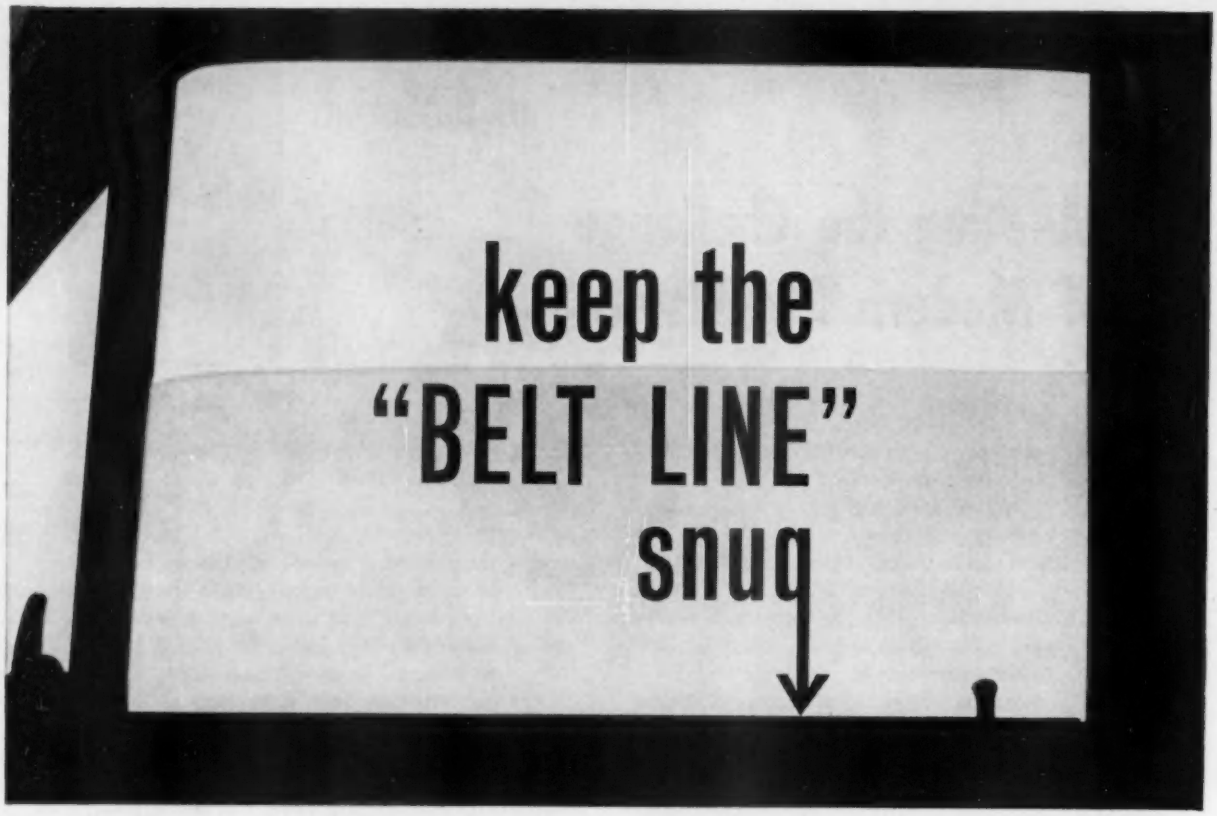
PARALLELING THESE ADVANCES, progress has been made also in the group activities of professional experts in these fields, through the Industrial Designer's Institute. This is a national professional society in which members exchange technical information concerning advances in the functions of design work. Through this society, a panel conference was arranged recently to obtain a discussion which would provide a documentary record of the outlook for future development in automotive design trends. The first portion of this panel session is digested and illustrated in this issue. A second part of the report will appear soon. The report supplies convincing evidence that American automotive designers are fully alert to all of the requirements of the future which can be foreseen today. For example, such unique and fascinating concepts as a "very thin flexible glass" are being studied. Road noise is being banished from car interiors. New power sources are being studied which may revolutionize vehicle power economy. "Human engineering" is being used to create cars adapted to more of the variations of driver and passenger needs. Scientific break-throughs are being made in uncountable numbers.

AS A RESULT, IT IS IMPORTANT to point out that today the automotive industries are seldom, if ever, equaled in their status as the largest single consumer of industrial design talent. Supplier industries can be confident that the experimental and prototype designs now being prepared behind locked studio doors will provide the basis for greatly expanded new production programs of the future.

THE IMPORTANCE OF SUCH PROGRESS is accented by the fact that it is created, nurtured, utilized and propagated by the dynamics of the private enterprise system. It is not in any aspect a creature of big government expansion, federal subsidies, enlarged national defense appropriations or other short-term forms of financial assistance. It is, moreover, the power source for this country's national economic prosperity of the future.

Hartley W Barclay

Editor and Publisher



with the right woven pile from Schlegel

Here, at the "belt line" of a modern automobile window, a weatherstrip must snuggle closely against the glass, sealing out dust and moisture. But the seal can't be so tight that the glass doesn't move easily.

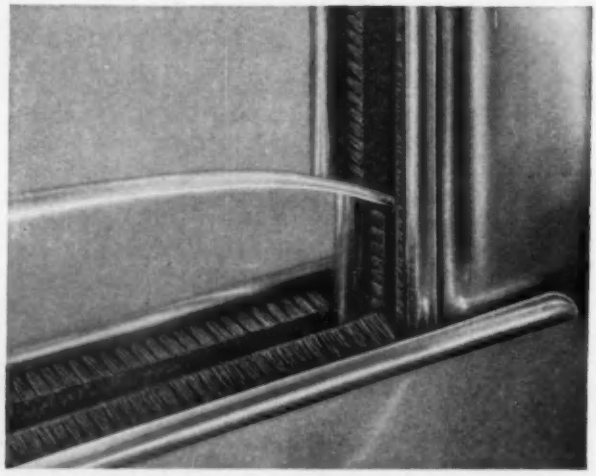
This is where you need the extra resilience of Schlegel weatherstrip pile.

See how the individual strands of yarn in Schlegel pile bend against the glass surface? Their natural resilience keeps the glass firmly in place, holding an effective seal for the life of the automobile. It compensates for even the widest manufacturing tolerances.

The pile you see is uniformly dense throughout and it stays dense to keep its sealing qualities for years. It's almost impossible to wear out.

To you, the extra quality we build into Schlegel pile means easier window movement; rattle-free, trouble-free windows; better sealing qualities—and complete dealer and customer satisfaction.

See what Schlegel woven pile can do for you. Check a sample in your wear-testing lab. When you specify glass run channel or belt strip assemblies, be sure to specify Schlegel woven pile liner—favorite of the industry since glass windows were first used in cars.



Glass moves friction-free, wet or dry, in this glass run channel with Schlegel woven pile liner.

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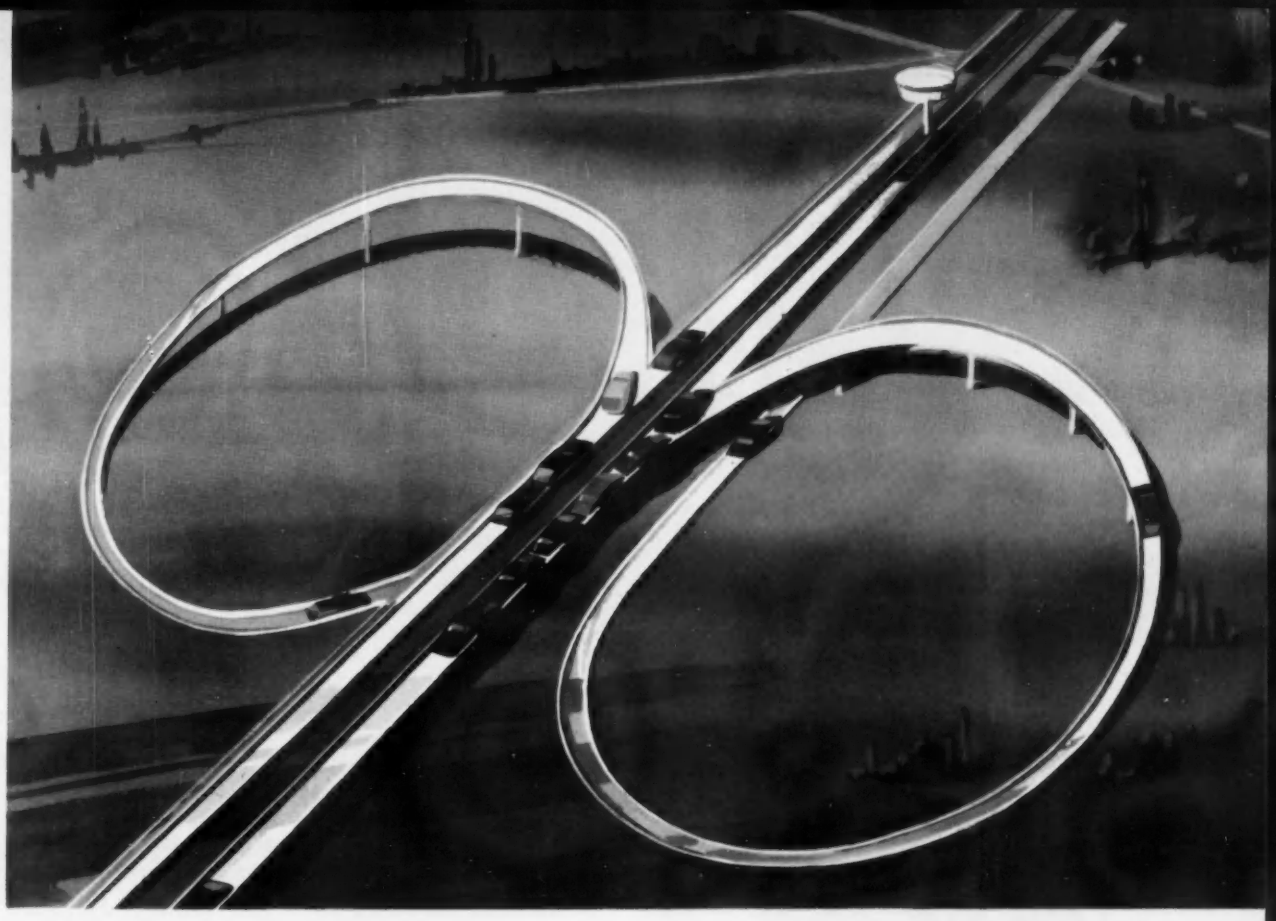


THE G.M. AUTOLINE

Architects of the Automotive Future

The Industrial Designers Institute was asked by the Editors and Publishers of Automotive Industries and Motor Age to form a panel discussion. This was accomplished. A group of qualified industrial designers professionally practicing the art of automotive design met to discuss automotive styling and the contributions made by the industrial designer.

Panel moderator was Kenneth A. Hopkins, Detroit Chapter Chairman of Industrial Designers Institute, associated with Lawrence H. Wilson Associates, industrial designers. Panelists were, Charles Jordan, chief designer, Cadillac Studio, General Motors Styling; John Najjar, executive stylist, Advanced Styling, Ford Motor Co; Richard Teague, assistant director of automotive styling, American Motors Corp.; and, Arthur Tarabusi, designer for Automotive and Industrial divisions, Great Lakes region, Reynolds Metals Co.

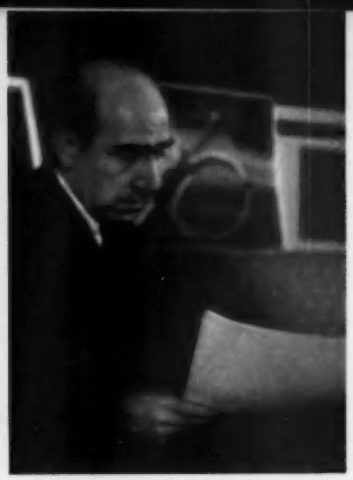
Editor's note: Meeting the challenge of improving mobility in automotive transportation is one of the biggest tasks facing the automotive industry at every level from designer to dealers. The following digest of ten tasks of the Automotive Industrial Designer gives details of how typical top designers are helping to solve the nation's vehicular improvement problems.

Mr. Kenneth Hopkins: What is the role of the automotive industrial designer?

He is a businessman as well as a designer. He is concerned with far more than design in an abstract sense. He is acutely aware of the consumer's needs and demands for utility, reliability, safety and economy, from which the ultimate consumer derives comfort and pleasure.

Our discussion will show how the product is born and matured

Charles Jordan—"The designer must utilize esthetics to turn lifeless dimensions into a beautiful, exciting and dynamic vehicle. His artistic sense comes into focus here."



John Najjar—"Pre-design research involves keeping in touch with the latest in market research and design development . . . By discussion with authorities . . . by reading authoritative publications."

Richard Teague—"We have an extremely close working relationship with our top management—a compact management group—which enables us to move very rapidly on getting decisions . . ."

Kenneth Hopkins—"If people are made safer, more comfortable, more eager to purchase . . . and just plain happier . . . the designer has succeeded."

through pre-design research, through design projects, the application of specialized design tasks. The designer must respect human requirements. He must understand production economies. He must analyze consumer and market research facts. He must create a pleasing and exciting image in which there is good taste and good judgment.

"Bear in mind," to quote Henry Dreyfuss, prominent industrial designer, "that the object being worked on is going to be written on, sat upon, looked at, talked into, activated, operated or in some other way used by people individually or en masse." When the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed.

On the other hand, if the people are made safer, more comfortable, more eager to purchase, more efficient or just plain happier by contact with the product, then the designer has succeeded.

Our questions will be headed by specific topics, the first of which is "Pre-Design Research" and the question is, "What actions are taken by Automotive Designers to use research to evolve original design concepts?" Mr. Jordan, you may start the proceedings.

◀ Arthur Tarabusi—"The automotive designer converts the new concepts of design methods and fabrication into feasible automotive applications by developing alloys of suitable strength."

Below: The panelists gather round the meeting table to express their views as described in this and a subsequent article on the future of automotive design ▼

The Gyron, by Ford stylists, is a delta-shaped vehicle envisioning two running wheels instead of the usual four. It is 209 inches long, 44.85 inches high, 86 inches wide.

The future experimental Atmos was also designed by Ford. Wheelbase is 105 inches, the Atmos is 220.58 inches long, 48.1 inches high and 79.7 inches wide.

Mr. Charles Jordan: One of the first and most important considerations in a design concept, is the position of the passengers and their relation to the interior compartment, seating comfort, interior roominess, ease of entrance and exit, visibility and many other considerations in the interior of the car are related to the size of the people.

The Size of People

To design machines to suit the man, we must know more about his size, shape and capabilities. To aid the design process, the research group at General Motors Styling has developed a people-measuring device called an Anthropometer. The Anthropometer can measure over twenty important body dimensions. People are measured not only in inches, but also in percentiles, a measurement of their relative size.

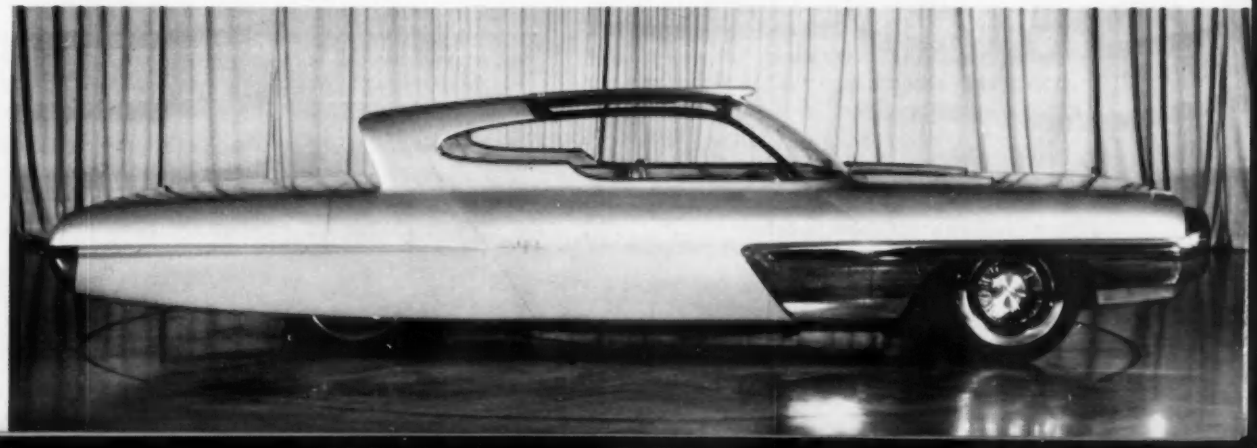
If, for example, a hundred people representing the consumer were standing in line from the shortest to the tallest, the fifth from the shortest would be the fifth percentile. The fiftieth person in line, the fiftieth percentile and so on. Generally a satisfactory design range, we find, is between the fifth percentile and the ninety-fifth percentile.

A study of this raw data has produced many new approaches to design. For example, once knowing the variation in seated eye height, a seat may be designed which adjusts to keep the eye point constant for maximum visibility. Further study of the data may reveal that controls such as steering, brakes and accelerator pedal would be easier to operate if adjusted individually to the reach of the driver's arms and legs, rather than the driver adjusting his seat to reach these controls.

Mr. Hopkins: Mr. Najjar, may we have your comments?

Mr. John Najjar: Pre-design research is an im-

La Galaxie, designed by Ford, was developed to explore future styling concepts as they evolve from engineering and technological advances. Its overall height is 51.8 inches.

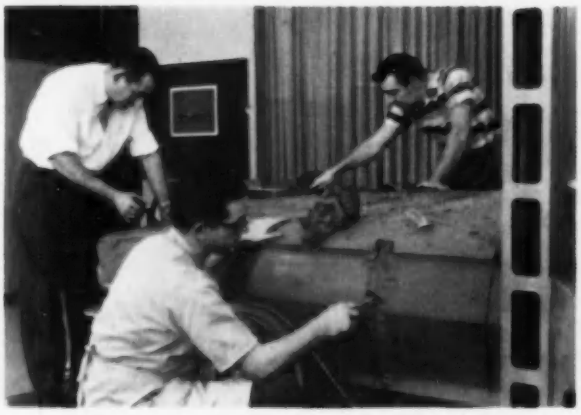


1 Styling experts in round table conference mark the beginning of the design program

2 Original color sketches of important design details are prepared for many components

Eight Steps in

5 Larger models are sculptured in clay to visualize overall design concept and harmony of lines



6 The full scale model in clay is developed with a height gauge measuring control of the work

portant part of the automotive designer's function. This involves his keeping in touch with the latest in market research and design development through many means. By discussion with authorities in these fields, by close contact with his company's scientific research activity and through reading authoritative publications.

From the germ of some new principle, he will initiate in the advance styling area an exploration of new surface configurations. At times the exploration of a series of these new principles makes it possible to develop a "dream car," a vehicle whose concept may be far different than current concepts.

Value of "Dream Cars"

In effect, these "dream cars" serve as a three-dimensional concept for the future, which can be evaluated by both company management and the public and create an image to which scientific research and engineering can relate their own design thinking.

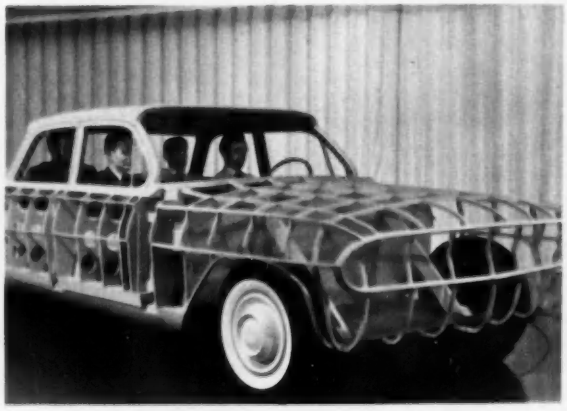
Mr. Richard Teague: All major automotive companies have within their styling areas research or advanced design sections, in addition to the regular production studios. American Motors is no exception. This is the area where there are very few restrictions put on a stylist and he is free to explore new shapes, forms and proportions that the regular production stylists only dream of. Here the theoretical car of some probable future date is sketched, laid out and modeled. It could be of the ducted fan, fuel cell or turbine type approach. Because the research stylist is generally working from rather sketchy power plant and chassis information, he is quite often

3 Craftsmanship expressed in table-sized models brings designers' drawings to life

4 Style lines are further developed in color on studio blackboard as the next step

Designing a Cadillac

7 Structural details are visualized so that all interior dimensions can be verified and checked



8 The finally completed new Cadillac is thoroughly studied by the design group

called upon to work very closely with research engineers in evolving component layouts of unconventional vehicles.

Mr. Arthur Tarabusi: As the automotive companies do research, we of the aluminum industry also do considerable research in all phases of design engineering in metal finishes. Our metallurgical laboratories, engineers and designers are continually working on projects in conjunction with the automotive and other companies.

The automotive designer converts the new concepts of the design methods and fabrication into feasible automotive applications by developing alloys of suitable strength.

Mr. Hopkins: Our second topic, "Design Projects." The question, "Please list the steps in a typical design project, from the original idea stage to the project completion."

Mr. Najjar: Styling at Ford Motor Company, together with other company activities, participates in discussions concerning forthcoming models. From these discussions emerges a resolution for an initial set of plans for these models. These plans outline, among other things, sets of package dimensions defining the scope of the future projects. As three-dimensional models are developed, these dimensions may be altered to meet specific new requirements subsequently arising.

Initially the models are shown in solid clay, with the exterior surfaces painted and bright areas silver foiled. They are shown subsequently with a see-through roof in order to achieve a more realistic appearance.

It is in this latter stage that general sheet metal approval is given. A plastic record mold usually is made of the approved model and a

The composite of all dream cars. All five automobile manufacturers applied the genius of automotive styling to create one average composite car for public showing

number of full-size casts provide additional armatures for further work on various body styles.

It should be clearly understood that throughout all the phases of full size clay model development a constant pulse-taking relative to tool cost, piece cost, engineering feasibility, product desirability and appearance is undertaken. All of these factors must remain consistent with the established objectives of the program.

Mr. Tarabusi: At Reynolds the design project usually begins with a request from one of the automotive or other companies who are interested in exploring the possibilities of using aluminum for their product. Our job as designer is to produce the use of aluminum in design wherever possible.

Mr. Teague: The current Rambler American is an excellent example as an answer to this question of Design Projects. It was decided in early spring of 1959 that the 100-inch American should be completely restyled for 1961.

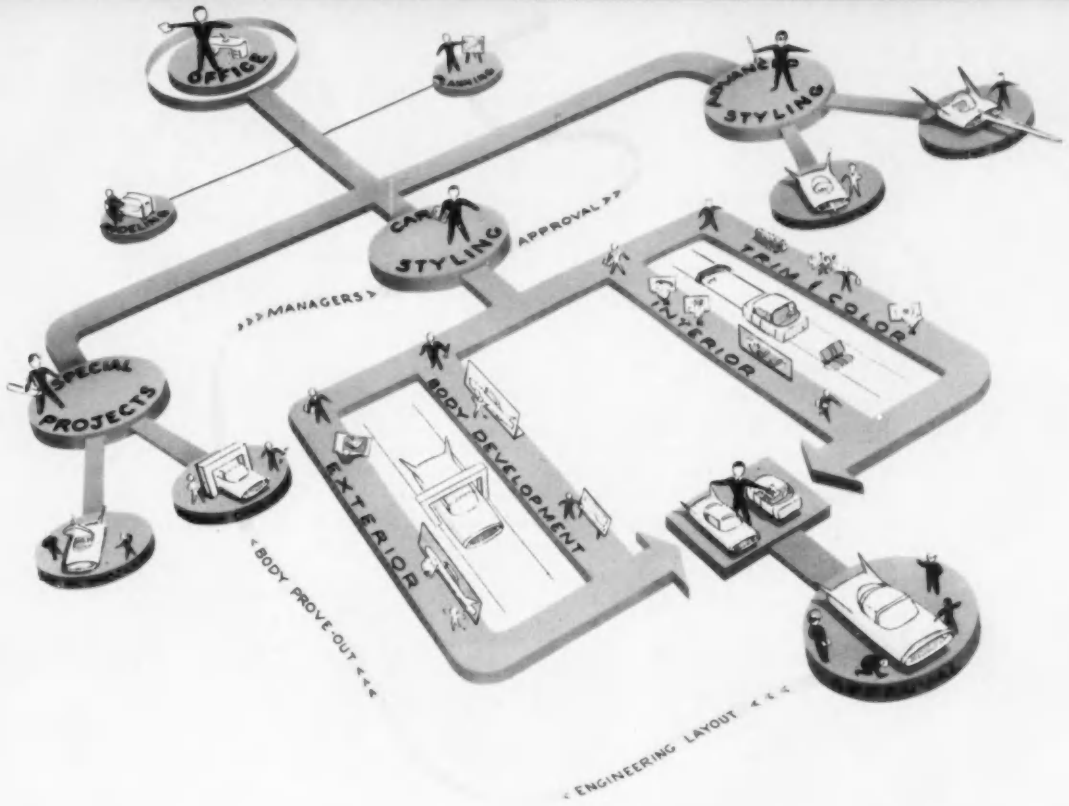
Design-wise it was a target from the beginning that the car should be clean, crisp, straightforward and above all else, lasting and contemporary in concept.

Two clay bucks (one a four-door sedan and the other a four-door station wagon), were mocked up and within the next 30 days several separate side treatment designs of totally different character were modeled on these forms for management review. Incidentally, American Motors is unique in that it has an extremely close working relationship with our top management group (a compact management group), which enables us to move very rapidly in giving decisions which is so vital to any program.

Concurrently with the beginning of this extensive modeling program, idea sketches and renderings were also begun within both the exterior and interior styling studies.

Within several short weeks after this, the first metal prototype was completed and further evaluation was made by management, and the program insofar as styling was concerned was complete. This, I believe, was a record in the automobile industry.

Mr. Jordan: At the beginning of a new design program at Cadillac, the design group in the studio first sit down together to develop the overall goals of the program. The degree of change



Design process chart developed by Ford Motor Division shows the step-by-step progress of design functions from start to finish

is known, the basic engineering limitations have been established and the designer designs the car in words as much as you can design a car in using words. Then, individually, members of the design group set to work on exploratory sketches of an overall design concept, experimenting with the most promising ideas with the aid of a sculptor and a small-scale model.

Meanwhile, the engineering group in the studio establishes the architecture of the car by carefully laying out proper seating in a roomy interior compartment and combining this information with the layout of the chassis, engine and other components that make up the anatomy of the car. A full-size seating buck is then built to check this seating and the interior compartment.

Now the design group and the engineering group join forces. Over the architecture of the car, the designer explores the most promising design ideas full-size. To check out the full-size design, a full-size illustration is made from the developed lines.

After the design has been evaluated and perfected as well as possible in two dimensions, templates are made from the four views of the drawing. The modeling group in the studio now begins a full-sized clay model.

Continual changes are made of course, until the design is right in three dimension. The clay surfaces are perfected and shown for management approval. During the full-size clay model development, the Cadillac Division and Fisher body engineers are in the studio often working with us toward a practical production design.

The final examination, then, of this design process comes when the fiberglass model has been completed with a finished interior and exterior and shown for final management approval.

Mr. Hopkins: Our third topic deals with Specialized Tasks. Gentlemen, please give one or more specialized tasks which must be performed by the automotive designer.

Mr. Teague: In the development of any product, whether it be an automobile, appliance or a building, the manufacturer's basic philosophy or image must be reflected in the final appearance of this product.

This policy, of course, is determined by the success of previous years, elaborate market surveys and other methods.

BIOGRAPHIES

Mr. Charles Jordan is a graduate of Massachusetts Institute of Technology and the recipient of numerous design awards. He is currently chief designer, Cadillac Studio, General Motors Styling.

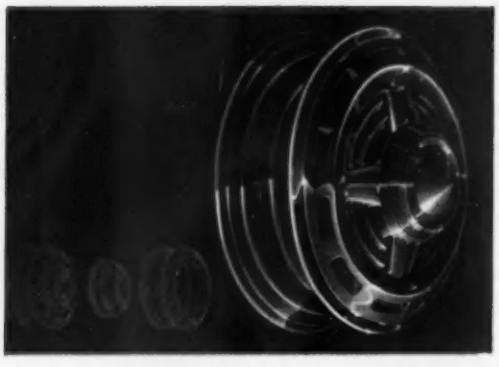
Mr. John Najjar—Was appointed executive stylist, Advanced Styling, Ford Motor Company, in 1957. He joined the Ford Motor Company in 1936. He has been cited by the Industrial Designers Institute for outstanding product design.

Richard Teague attended Art Center School, Los Angeles and the University of California. He is assistant director of automotive styling, American Motors Corporation. He is a well known authority on sportscars and classic and antique cars and is past chapter president of the Veteran Motor Car Club of America.

Arthur Tarabusi—Attended Ohio Weslyan University and the University of Iowa. Currently he is designer for Automotive and Industrial Divisions, Great Lakes Region, Reynolds Metal Company. Mr. Tarabusi is the current Treasurer of the Detroit Chapter of Industrial Designers Institute.

Kenneth Hopkins currently is Detroit Chapter Chairman of the Industrial Designers Institute. A graduate of the Cleveland School of Art, he has been associated with important product and automotive designers. At present he is associated with the industrial design consultant firm of Lawrence H. Wilson Associates, Detroit.

Below—A dramatic color rendering of a designer's concept of a future high speed controlled course vehicle evolved by American Motors



An example of an advanced design idea for a vehicle wheel developed by Reynolds Metals designers

The GM Autoline

Mr. Jordan: Here is an example of some aspects of vehicle utility that we might expect in the future.

Recently, the research people at General Motors styling developed a new concept for the transportation of passengers and called it the Autoline.

The purpose of the Autoline is to improve inter-city communications through a reduction in travel time, inconvenience and total cost. We believe, for example, that sometime in the future it will be possible to provide a private transportation system with vehicles which operate in two distinct ways. One, the vehicles would travel on ordinary streets at moderate speeds in the familiar manner. The same car, possibly with an added power unit rented from the highway agency, could be put on a limited access roadway and travel under electronic control at speeds of perhaps two or three times as great as present between points separated by a considerable distance.

These vehicles would operate on their wheels in the normal manner until entering the system. The driver would pull up to an entrance and punch his destination into a console. A computer would program him into the traffic flow at the right moment by means of a spiral acceleration ramp. The car would then enter the traffic stream under automatic control in a programmed opening at low relative velocity. ■

This is the first of a two part article on "The Architects of the Automotive Future." Part II will appear in our July 15 issue.

This is the place for quality Nickel-Chrome Plating

If salt air won't harm quality Nickel-Chrome brightwork, what will? Rain? Grit? Exhaust fumes? All these meet their match in the diamond-like sparkle of quality Nickel-Chrome Plating.

For bumpers and other trim parts subjected to rugged service, *Double-Layer* Nickel Plating provides outstanding *protection-in-depth* against corrosion, wear and abrasion.

Two good, thick layers of Nickel—plus chrome—keep brightwork brighter, longer.

This lasting brilliance adds extra sales appeal to any car. Just wash it, wipe it dry and watch it sparkle.

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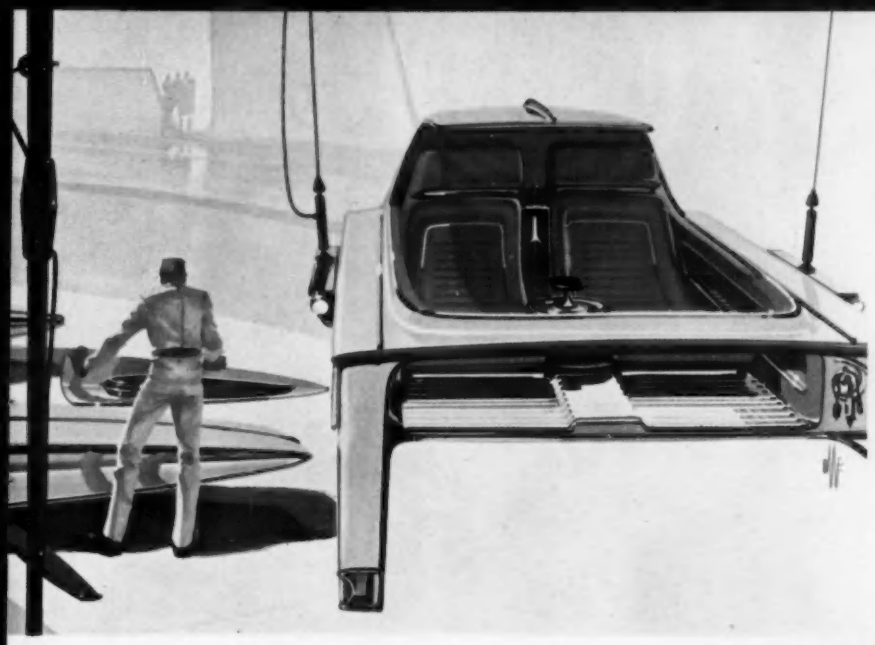
NEW SHAPES NEW FORMS IN STEEL

CREATIVE imagination of America's designers and engineers give impetus to the emergence of an exciting new world. A world of imagination, a world of design creativity, a bold new world of ideas. AUTOMOTIVE INDUSTRIES and MOTOR AGE wish to transport you across the threshold of this stimulating new world of tomorrow. We hope this glimpse into the future will spark your creative imagination. These are just ideas in design and

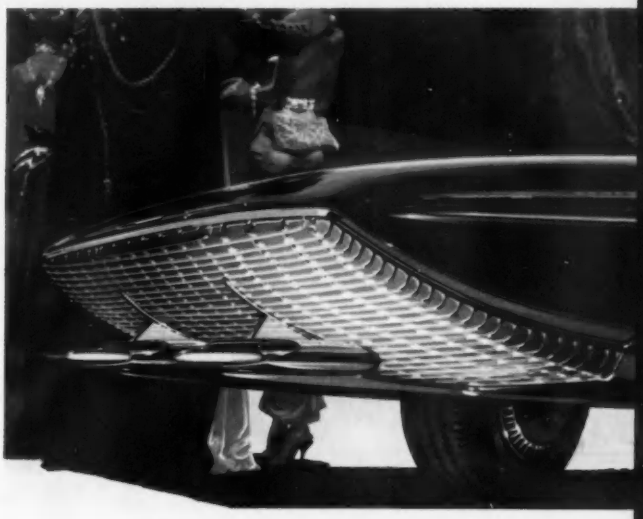
◀ This intriguing sedan of tomorrow is designed for extremely fast, comfortable and safe travel in the highly mechanized world of the future. Made of alloy steel framing and aluminum-coated carbon steel for body shell paneling for lightness and strength, plus exceptional rigidity.

Unusual construction and power plants that will use imaginative designs and systems for energy exchange are in the works for the future. These drawings are not simple flights of fancy but oftentimes accurate predictions of the many new products you'll be using in the future.



The hum of powerful machines, the drama of final assembly are captured and held for a moment as this bold new two-place vehicle receives its finishing touches by hand.

Tomorrow's demand for high fashion plus function are answered by this luxury car that is styled to be equally at home on the road or at the club.



engineering, strange and fanciful, yet, well within the realm of future possibility. They are compatible with advances in material technology of our present age.

Think back a few years, maybe ten or twenty. Would you buy the story of what we have today? We wonder! In the strange world of tomorrow, a world sometimes difficult to imagine—changes will be incomparablv dynamic. ■

The designer calls this a "cook-out" car. Food is prepared on a portable solar stove. The power is supplied by aiming the mirror-bright, stainless steel focus screen of the Solar Converter towards the sun. The food conditioner is made of easy to form Vinyl Coated steels, neat and easy to clean.

Illustrations courtesy United States Steel Corp.

Ford Styling

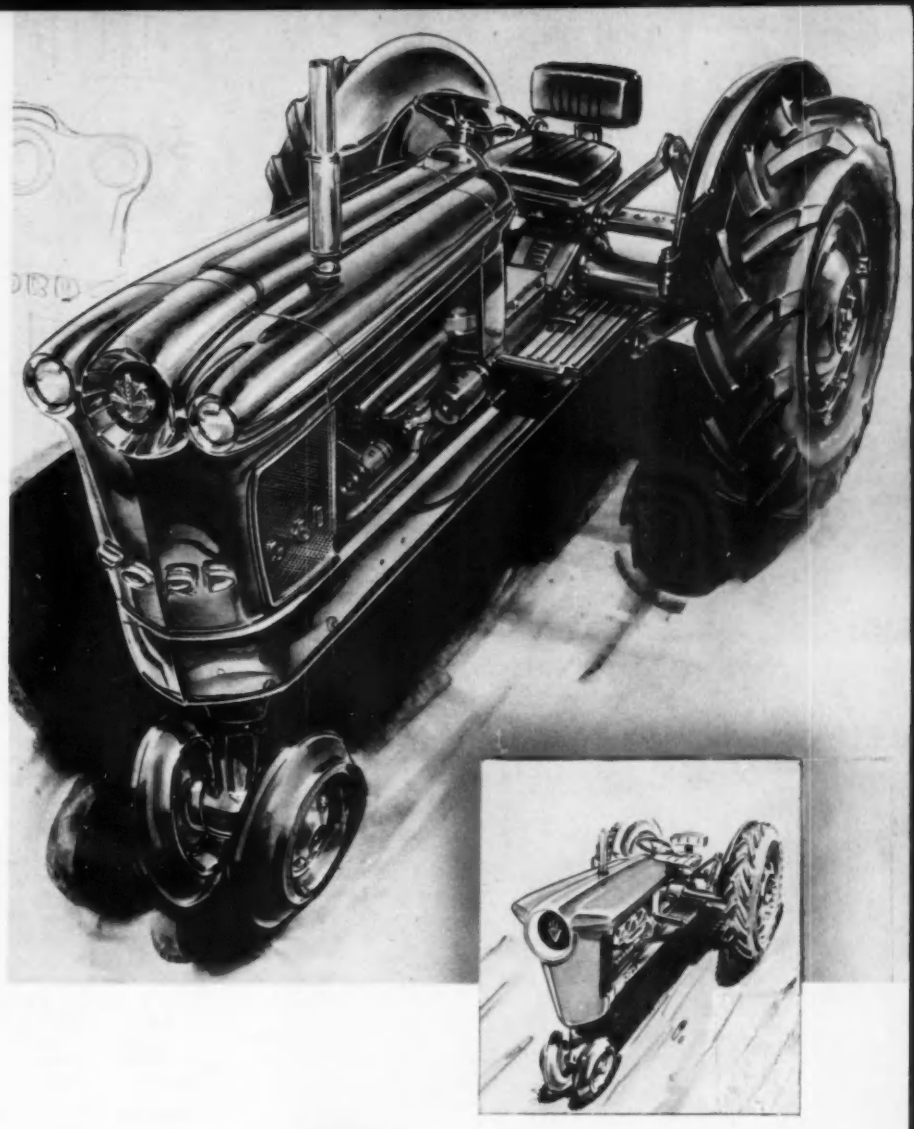
A CASE STUDY IN MODERN DESIGN

By Joseph Geschelin
DETROIT EDITOR

ALTHOUGH functionalism and efficient performance are the most important characteristics of a heavy duty tractor, pleasing appearance is a consideration since even the work horse of the farm is expected to reflect the contemporary scene. It is with this in mind that the Tractor and Implement Division, Ford Motor Company decided to draw upon the talents and imagination of the Styling Office for developing a styling theme for the "6000," diesel-powered tractor, announced several months ago.

This new addition to the line is the largest and most powerful tractor produced by the division, having about double the weight of the largest model built up to now. Styling of a large tractor limits the scope of the designer to a greater extent than does a motor car since the entire backbone—the power train—is completely defined by engineering; and since so much of the mechanism must be left exposed.

On the other hand, the stylists had this advantage:



◀◀ A significant saving in time was effected in the styling development of the Ford 6000 diesel tractor shown left. The Tractor and Implement Division provided the stylists with a full-size metal armature, ready to receive its wood and clay covering in the studio. Ordinarily, clay modeling is done on a wood armature which must be built in Styling's fabricating services shops.

This larger rendering is typical of the way in which certain smaller sketches are developed in greater detail. The sketch shown at lower right attracted interest at the time because of its evolutionary character.

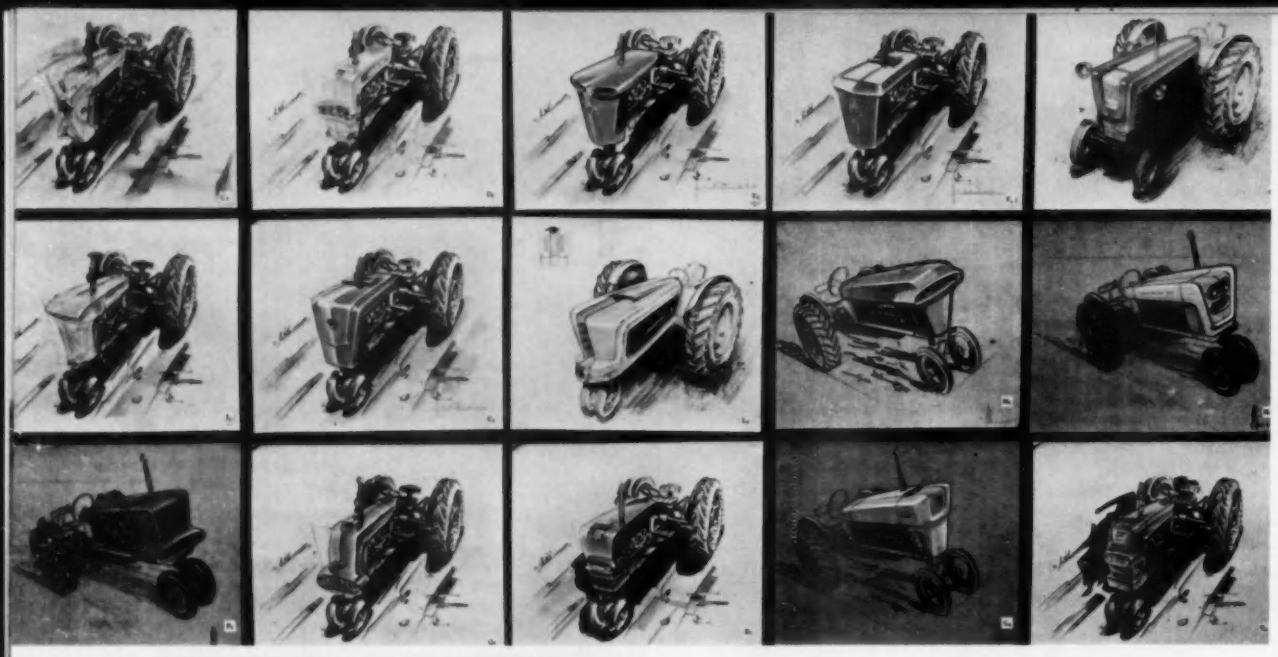
Designs a Tractor

they could start with a clean slate because the entire machine was to be new and there were no preconceived ideas as to its appearance. Moreover, styling was able to omit some of the usual time-consuming steps in procedure because they were able to start work with a full-sized metal armature provided by the division. It was a fortunate circumstance at the start of the program that components for the entire power train were available for this purpose. Otherwise, it would have been necessary to build a wood mock-up from installation drawings.

HOW STYLING BEGAN

Styling began with a methodical approach by preparing a large variety of idea sketches and drawings to a small scale to explore the possibilities of a rational design scheme. Innumerable drawings sketched combinations of forms and profiles, including different arrangements of headlamps and decorative motifs. From the very start there was close coordination between styling and the product planning group. As mentioned earlier, the availability of a full sized metal armature eliminated the usual intermediate stages of producing a wood mock-up as well as small-scale clay models.

As the mass of idea material developed, Elwood P. Engel, staff stylist under whose direction the styling was being done, and E. Scott Rumely, Tractor and Implement Division product planning manager, called in the executive group of the tractor division to begin the initial process of sifting the sketches and reaching some agreement on an acceptable design theme.



Just as in a passenger car program, three-dimensional work on the new tractor was preceded by a sketching phase in which a great many small illustrations were developed to explore new themes and also the continuation of existing themes. While such sketches are rarely translated into final product in their entirety, they are helpful in establishing design direction and the treatment of specific features.

◀ As is true in styling programs generally, regardless of the product involved, the most favored of the Ford 6000 renderings subsequently was done in full-size clay. This particular design was well thought of at the time. Later, however, it was decided to revise the arrangement of the emblem and headlights.

The circular treatment developed in the earlier full-size model was modified to the extent that the emblem and headlights were no longer in the same horizontal plane. And an air intake was added to the hood side sheet metal.

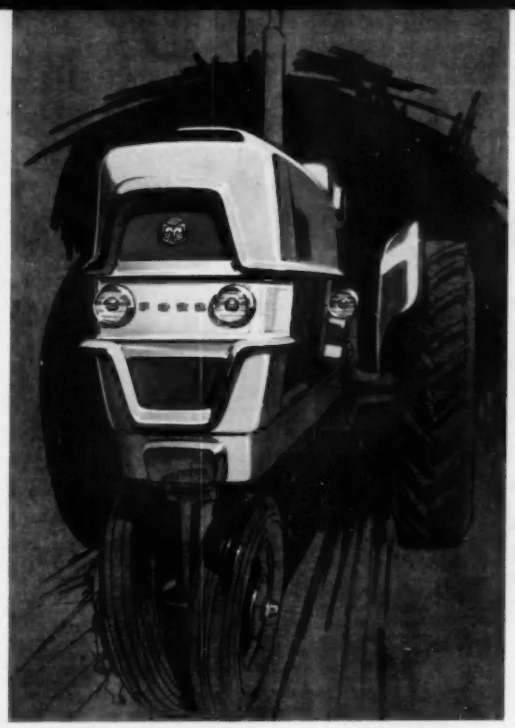
In this alternate design the headlights were arranged one above the other. The emblem was abandoned here in favor of Ford lettering, although it reappeared on a later model. Bottom picture, and one preceding it, illustrate another time-saving technique, which involved the use of interchangeable front ends, making it unnecessary to change the entire model as modifications were made.

The executive group consisted generally of the following: general manager of the division, chief engineer, general sales manager, manufacturing manager, comptroller, purchasing agent.

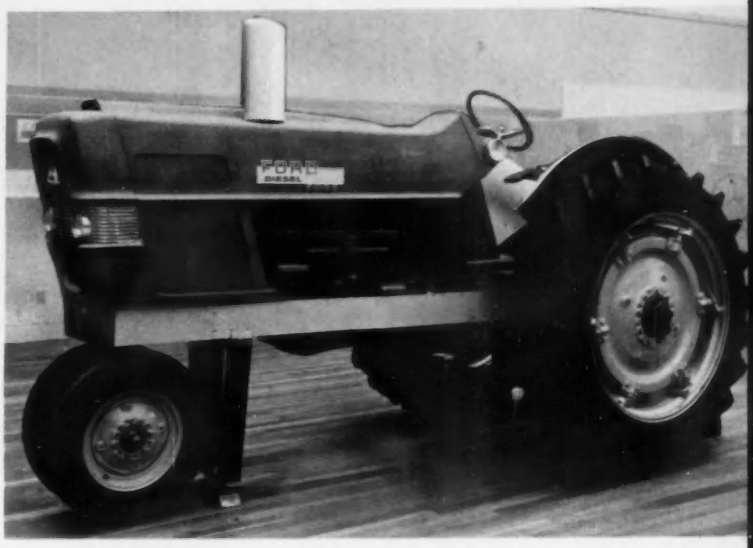
EXECUTIVE GROUP

The executive group visited the styling studios on a number of occasions. The product planning group made more frequent visits to iron out details, particularly in features that were associated with engineering design as well as manufacturing problems.

Through this process the general features of design were narrowed down to the point where a final decision could be reached. At this point, the executive group was joined by George W. Walker, vice-president and director of styling, and I. A. Duffy, general products group vice-president, to gain top level concur-



By this time, decision-making with respect to styling had been narrowed down to the treatment of the front end. Rather than spend the time that would have been required to work out each possibility in full-size clay, the stylists carried out their experimentation in the form of detail renderings.



This clay model represented the final selection of sheet metal treatment and of front end design theme. It was felt that its forward-thrusting appearance suggested power and movement.

Unlike passenger car programs, in which exteriors and interiors are developed concurrently but by separate groups, the limited number of stylists and modelers available for the tractor program made it necessary for the same group to handle both the Ford 6000 exterior and interior. Early efforts were concentrated on a three-spoke wheel, which was changed later. Forward vision, visibility of the instruments and accessibility of the controls all were serious considerations.

rence. Once the choice was narrowed, styling was able to start work on a full-sized clay model built over the armature.

WEIGHT CONCENTRATION

One of the distinctive features of the "6000" tractor is the requirement of heavy weight and massiveness. Heavy weight concentration over the front end, which is required to balance the torque reaction at the rear, dictated that the front end structure—usually the radiator grille—would have to be a massive cast iron component. In fact, this piece alone weighs 376 lb.

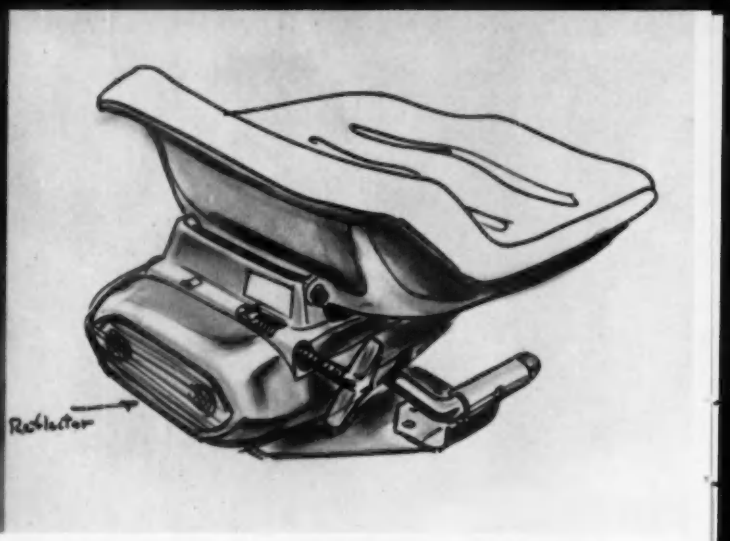
A good deal of discussion centered about the most economical way to produce this part: could it be made as a one-piece casting; or should it come out in two or three sections, fastened together. Purchasing found a foundry source endowed with special techniques that promised to produce the part as a one-piece casting, with surface finish that satisfied styling.

FINAL DESIGN

Because of problem of correlating styling detail with the most economical foundry practice, styling experimented with clay models of the front end executed in two independent sections which were readily installed or removed. This made it feasible to arrive at a satisfactory final design after numerous trials. This procedure bypassed the necessity of making numerous full-sized clay models for acceptance, marking another time-saving device. After the clay model reached the completion stage, the executive group together with Mr. Walker and Mr. Duffy was called in to give final approval.

Meanwhile, the designers also were working concurrently on idea sketches for the development of the cast iron instrument panel and steering wheel; decorative treatment, model identification, etc. Seating arrangement in this tractor is closely associated

The steering wheel that was finally selected, shown here in full-size clay, emphasized the hand grips and a readjustment of the two spokes for maximum strength.



Optional seating and seat controls were developed first in the form of sketches such as this. Here the major considerations were safety, comfort and accessibility of seat adjustment.

with the design of the steering wheel as well as placement of the instrument panel since the operator handles the controls while seated or in a standing position.

VISIBILITY STUDIED

Another matter of interest is the development of the profile of the styling envelope in the plain view. The operator must have full visibility from his station. Consequently, while the profile may be wedge-shaped, the wider face of the wedge has to be in front rather than in the rear. This had to be considered by the stylist regardless of how he would like to make the profile.

Once the clay model received final approval, the stylists were ready to proceed with the final steps in the process. In some studios the clay model is used to take off fiberglass impressions which are then delivered to engineering as the basis for producing product and tool drawings. By contrast the Ford studio prepared a full set of drawings of surface developments, then produced a set of templates for the entire structure. These constituted the material from which engineering was able to prepare its own production drawings.

After engineering had prepared the detail drawing, styling compared them with the clay model to make sure of proper correlation.

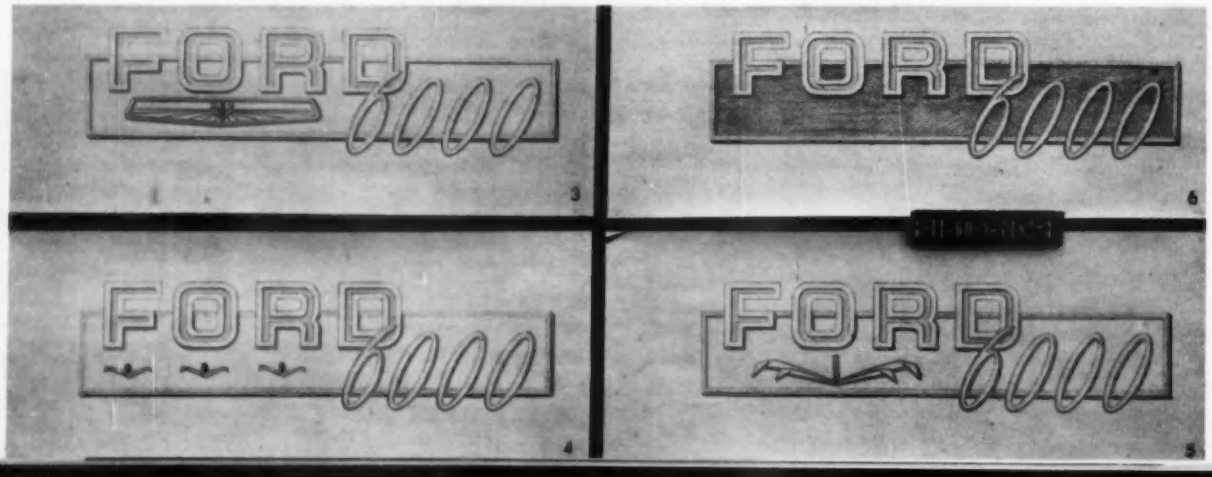
MANUFACTURING ASPECT

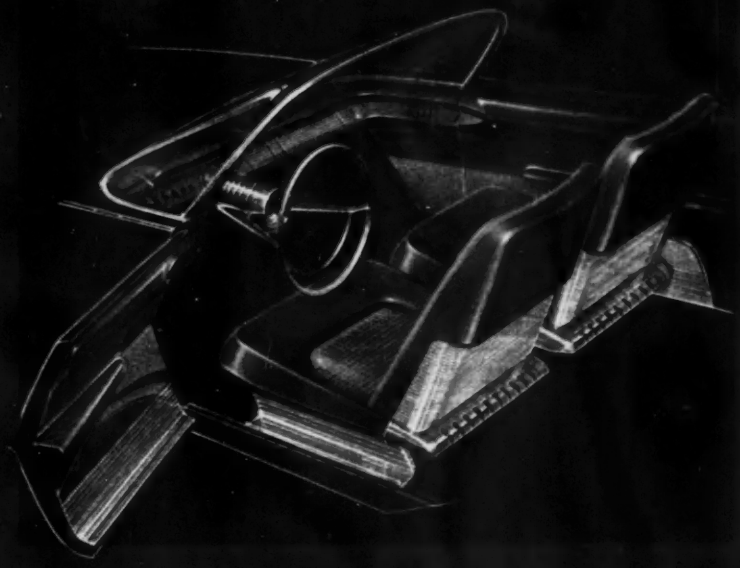
The role of the manufacturing department was given full play during the initial stages as well as during the engineering department stages, i.e., before the design was ready for release for production. Many intimate design details were ironed out by joint action to make sure the final design was suitable for economic manufacturing.

Consider the photograph of the production tractor. It is of interest that the front end is a massive gray iron casting. The decorative area containing the headlamps is an aluminum extrusion. The unique Ford insignia at the front as well as the model identification on the sides are made of plastic. The hood is of sheet metal. The instrument panel is a gray iron casting, weighing 94 lb.

Supplementing this brief highlighting of the styling program are some illustrations taken from styling files. The caption material will serve to describe the various steps in the process selected for this article. ■

Like other aspects of the styling of the Ford 6000, the development of side ornamentation began with sketches. While none of those shown here represent the actual ornamentation, the sketch at the upper right was the most favored and was changed only to the extent that a diesel designation was added.



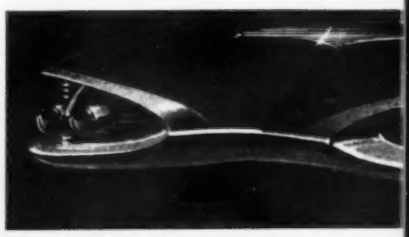


Aluminum Trim

combines lasting,
sales-appealing beauty
with fabricating and
finishing economy

Exterior Trim

WINDOW AND PILLAR MOULDINGS



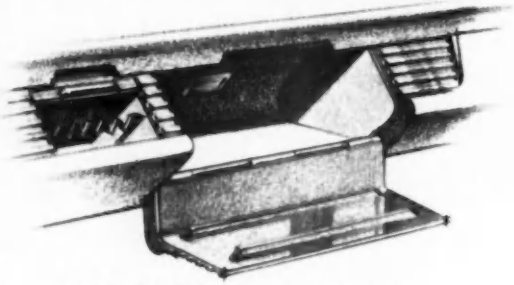
GRILLE AND GRILLE MOULDINGS

SIDE MOULDINGS

REYNOLDS ALUMINUM

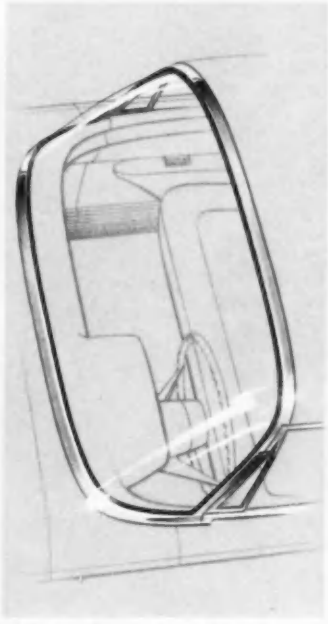
Interior Trim

SEAT SKIRTS AND SEAT BACK TRIM

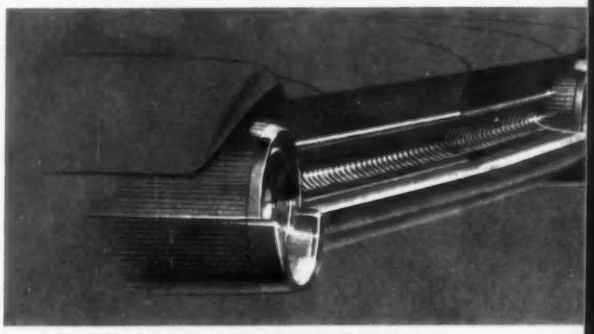


ASH TRAYS AND COVERS—
GLOVE BOX DOORS

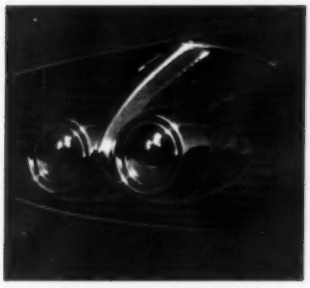
HUB CAPS—WHEEL COVERS



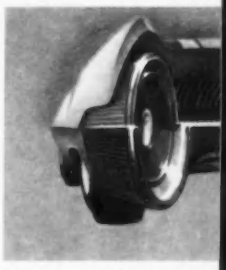
WINDSHIELD AND ROOF MOULDINGS



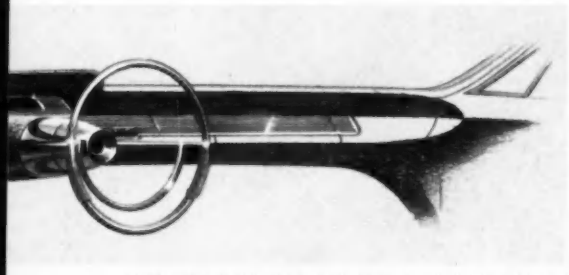
REAR BUMPER OR DECK TRIM—
QUARTER PANEL APPLIQUES



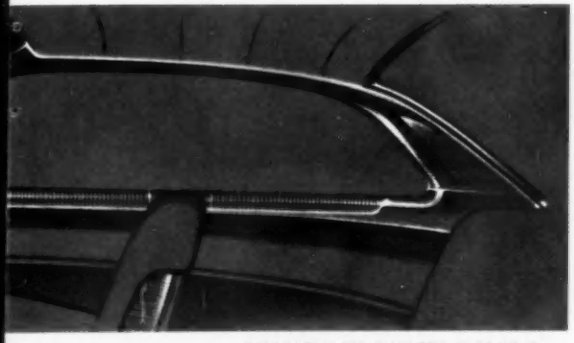
HEADLAMP BEZELS



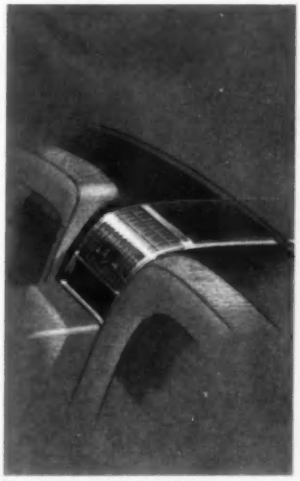
TAIL LAMP HOUSINGS



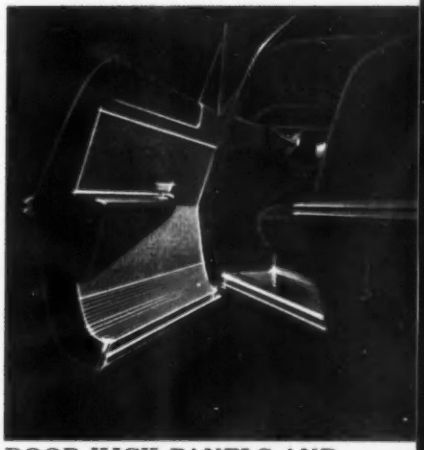
INSTRUMENT PANELS AND TRIM



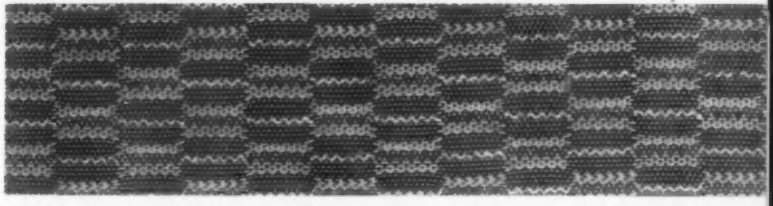
WINDOW MOULDINGS—
PILLAR COVER TRIM



RADIO SPEAKER GRILLE
(expanded or perforated metal)



DOOR KICK PANELS AND SCUFF PLATES



ALUMINUM YARN (REYMET)
TRADE MARK

Aluminum Trim

combines lasting, sales-appealing beauty with fabricating and finishing economy

Here are some of the reasons why you can get these important sales and manufacturing advantages with aluminum:

Aluminum's versatility in fabrication contributes to production savings and better part quality

There is one major reason why aluminum trim can save you money: *aluminum is adaptable to a variety of manufacturing techniques.* Because of this versatility, aluminum makes possible savings in tooling, fabricating, finishing and assembly costs—a combination of savings that cannot be obtained with other materials.

A good example is a typical aluminum exterior trim package. A standard package based on body mouldings, window mouldings, grille, grille opening mouldings, and hub caps runs $8.00 to $14.00 less per car than the same package in other metals. Conservatively, the average aluminum package saves $10.00 per car. Here are ways aluminum's versatility contributes to this saving.

Aluminum trim parts can be stamped, roll formed or extruded. As an example of the former, consider a side trim overlay framed with mouldings of another metal. This part can be made as a single aluminum stamping with embossing in the overlay area with bright surrounding mouldings—all in a single die. Tooling costs can be reduced. Substantial savings in assembly costs can also be realized. Similar savings can result from the roll formed aluminum approach as effectively used in several 1961 models. Although more commonly used in areas other than side trim, aluminum extrusions are still another approach where unusual variations in styling and design can be obtained with extremely low tooling costs.

Aluminum's versatility in finishing is an important cost and quality advantage

In finishing, aluminum's versatility again pays dividends in reducing part costs and improving part quality. Aluminum can be clear or color anodized. Contrasting colors can be added through the use of organic finishes. And, paint films adhere to anodized aluminum better than to other bright materials used for decorative applications. Warranty costs are reduced. A better appearance is assured over a longer service life.

Parts made of other metals must be buffed for maximum corrosion resistance. Some moulding parts, if not buffed on the back and edges, will rust with subsequent bleeding over the painted surface of the car. *Aluminum will not rust—ever.* Anodizing aluminum parts is much less expensive than chrome plating other materials. The final piece price of anodized aluminum parts is even less expensive than chrome flashed parts.

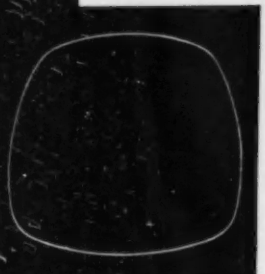
New aluminum textures and finishes contribute to design freedom and add sales-appealing beauty

There are wide varieties of aluminum textures, finishes and color combinations available to complement modern automobile exteriors and interiors. This variety is of particular interest in interior trim styling where aluminum trim parts lend themselves to a wide range of design ideas and also permit low cost styling changes.

Why it helps to call on Reynolds for trim package planning

The examples above are just a small part of the fabricating and finishing cost story made possible by strong, lightweight, rustfree aluminum—Reynolds Aluminum. For full details, talk to Reynolds Aluminum Specialists. These men are experienced in working with automotive companies on aluminum requirements, and they can put Reynolds many services and facilities to work for you. They will help you plan an aluminum trim package that will save you money and also help improve your products. Write or phone *Reynolds Metals Company, P.O. Box 5050, Detroit 35, KEnwood 7-5000. Or contact your nearest Reynolds office or write P.O. Box 2346-MZ, Richmond 18, Virginia.*

NOTE: Before you buy any part—have it designed and priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower final cost.



REYNOLDS ALUMINUM

the metal for *automation*

TRADE MARK

Watch Reynolds TV show "Harrigan & Son", Fridays—ABC-TV.

Door Lock Tests at Ford's Sandusky Plant

LIFE and cycle testing of automobile door locks and luggage compartment locks at the Ford Motor Co. plant in Sandusky, Ohio, are performed on a test rack where the shock level imposed on the locks is measured to assure consistency by sensing shock loads with an accelerometer and periodically recording the G level on a Brush Instruments Mark II direct writing two-channel recorder. Door locks are tested two at a time while trunk door locks are checked individually.

During door lock tests two Clevite self-generating accelerometers are mounted on the test rack and their output fed directly to the two built-in amplifiers of the portable Mark II recorder. Output of the accelerometers is approximately 22 millivolts per G. Gain of each channel of the recorder is set such that one chartline of pen deflection represents a load of one G. The two door lock shock loads are recorded on adjacent channels simultaneously.

Door locks are tested at a minimum load of eight G and the deck lid locks at 12 G. Shock loads imposed by the test rack which simulates the closing and opening o f a passenger car door are measured once each week. Setup time and recording of G loads requires a very short time. The accelerometer which has a threaded base is screwed rapidly into place and its cable connected directly to the Brush recorder. When the recorder is warmed up and the gain adjusted, a few door slams are recorded, and the check of G level is completed.

Life tests on the door locks require 80,000 "slams" while cycle tests consist of 5000 "slams." Life and cycle tests on the luggage compartment locks consist of 7500 and 1000 shock loads respectively. ■

Two door locks are life-tested simultaneously on this test rack. Shock loads imposed on the locks are picked up by two accelerometers and fed directly to a Brush Mark II recorder.

Trunk lid locks are tested individually on this test rack. Accelerometer and recorder provide records of shock imposed on lock.

←——Circle 140 on Inquiry Card for more data

PISTON SURVEY

1. Group of typical Bohn Aluminum Autothermic pistons: (left) open slipper design with head notched for the valves; (center) closed slipper type with wedge-shaped dome; (right) open type piston.

By Joseph Geschelin

DETROIT EDITOR

ALTHOUGH pistons have been used in engines since the first engine was built, the design of a piston for a new engine still is in the state of an art. An engine designer even today cannot reach for a handbook or for formulas in the solution of design detail in the same fashion as one can apply sound mathematical analysis in the design of a crankshaft or a spring.

So far as we can learn, piston design is largely an empirical process, based upon a long history of experience; also based upon the background of a specific engine family. The Engine Division at the General Motors Technical Center, which is constantly designing and building engines of all kinds, has recognized the empirical nature of piston design and is among those aiming at a more scientific approach, if one can be found in the future.

It seems apparent that when a new engine is being developed, the designer must rely upon previous successes, using such design criteria as have worked successfully in the past. Of course the designer is not all alone. Fortunately there are recognized experts among some of the major producers of pistons, whose know-how and experience with pistons, rings, and cylinder bores in the amazing variety of engines produced in the USA enables them to serve in a consulting capacity to the engine builders.

Among the best known and most frequently consulted are the specialists connected with such well known names as Alcoa, Bohn Aluminum, Zollner, Gillett & Eaton, Thompson-Products Div., and others.

Listed in the 1961 Products Guide Issue of AUTOMOTIVE INDUSTRIES (AI, December 15, 1960) will be found a large number of piston suppliers, including the ones mentioned above. The majority of these companies serve the industry through the availability of foundry capacity and machining facilities, supplying pistons to customers for original equipment requirements as well for the replacement market. Many of them represent the sources of pistons for engines for passenger cars, trucks, buses, marine, industrial applications, etc. Since the engine builders, particularly those who produce in large volume, require more than one source of supply, the contributions of these piston suppliers are vital and important.

Modern internal combustion engines have become a highly specialized breed with innumerable variations in detail unique to a specific engine builder. They are no longer simple nor subject to generalization. Today

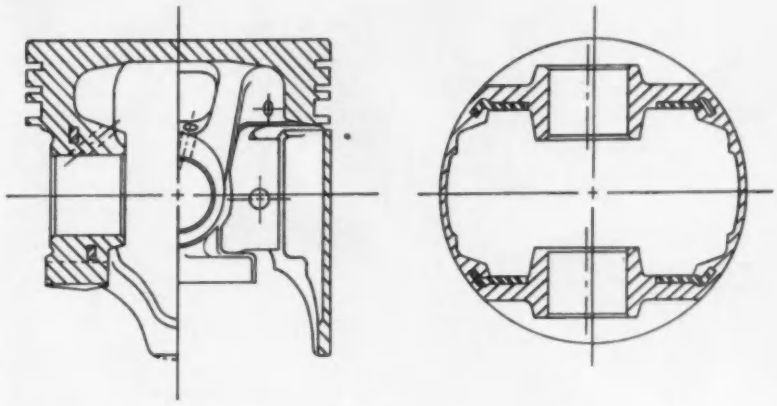
there are families of engines with numbers of engines of different output stemming from the same basic displacement. This, too, has an effect upon piston design, due to differences in dome configuration to take care of differences in compression ratio.

Pistons come in such variety as to defy attempts at a standardized approach. For example, in recent years we have had pistons with flat domes, with wedge-shaped domes, with depressed domes to take care of lower compression ratio, and with notched domes to provide clearance for valves in high compression engines.

One thing is sure, whatever the design of a piston for a new engine, in the final analysis the piston has to be accepted by the engine in service. The acceptable piston must handle the complex loading adequately, must be quiet under all operating conditions, must operate without scuffing or blow-by, and finally it must have adequate life. No matter how cleverly the initial design has been conceived for a new engine, the pay-off is how it behaves in the actual engine when subjected to dynamometer and road testing. Consequently, the design of the new piston comes about in several distinct phases: initial concept; then followed by suitable changes in design detail to meet the requirements of the engine. This also usually means changes in the permanent mold dies. We recognize this as a form of the cut-and-try process that has been the basis of most engineering in the past.

In a situation of this kind it is helpful to pinpoint trends in basic design. Here, too, we fail to find uniformity because of the tendencies and preferences of individual designers. True there are a few areas of agreement. One is in respect to the aluminum alloy. Today practically all passenger car pistons are made from essentially the same composition. As you will find in the section devoted to Zollner, an entirely different kind of alloy is employed for heavy duty engines and for Diesel engines. Another standard practice, almost universal, is the employment of a dipped tin coating on passenger car pistons to provide some measure of anti-scuff properties.

However, when it comes to basic design features the uniformity ends. Consider for example, the provisions for controlling piston expansion at varying temperatures. One of the oldest principles is the Autothermic* strut-type piston, originated by Bohn Aluminum. If you will refer to AI, January 1, 1961, there is a tabulation on page 44 of interest in this connection. It is noteworthy that of the 44 lines of data, 13 current engines specify Autothermic pistons, while


QUARTER SECTION THRU VERTICAL WRIST PIN AXIS.
QUARTER SECTION THRU VERTICAL THRUST AXIS.
HALF SECTION THRU HORIZONTAL WRIST PIN AXIS.

2. Cross-section of Bohn Aluminum Autothermic, open slipper type piston indicating the arrangement of struts within the casting. The horizontal section shows how the struts are locked in the edges of the skirt section and cut out around the wrist pin bosses.

14 makes show "steel strut" construction, without specifying a proprietary designation. Four others specify Conformatic (Sterling) pistons which employ a steel ring for thermal control.

The remaining engines do not specify either strut or control ring and may be assumed to be all aluminum. Such pistons rely entirely upon the flexibility of skirt design, stemming from the use of T-slots, transverse slots, or double T-slots. It is noteworthy, however, that these pistons perform just as satisfactorily from the standpoint of the specific engine designer. Moreover, the same designers have relied on the all-aluminum design for many years.

The strength and stability of the piston depends to a large extent on the proportioning of metal in the head and piston pin bosses. For one thing, this structure must be capable of handling the bending loading imposed by the piston pin. What is the general practice with respect to the way the pin is housed at the upper end? Some specialists believe that the optimum design is one in which the pin is of floating type in piston bushings. On the other hand, it appears that the pin fixed in the connecting rod end is by far the lowest cost design.

Let us look at the tabulation of page 46 of the same issue of AI. Out of the tabulation of 39 production engines, 30 have the pin locked in the rod, only nine are of floating type. Apparently the majority rules. But those who prefer the floating pin doubtless feel this is the one best way to handle their design.

Going back many years we have observed the general adoption, in mass production, of special equipment designed to make pistons and connecting rods of uniform weight. These techniques have been described in issues of AUTOMOTIVE INDUSTRIES in the past. This means that such piston and rod assemblies can be considered as being uniform in weight within close limits; and weight is no longer a criterion of selective assembly. It is generally true, therefore, that the only selective fitting at assembly is in matching pistons to suit individual bore sizes.

What about piston weight in current engines? According to the same tabulation—page 46—if the weights given there are tabulated in ascending order, the lightest piston—10.60 oz.—if found in the Studebaker Lark Six; while the heaviest—29.80 oz.—is in the Lincoln-Continental engine. The median weight (if the number has any significance) is about 19.58 oz.

The behavior of the piston in the engine is quite complex and that is doubtless why it is so difficult to apply anything but empirical analysis. For example, there is the heavy loading due to piston pin bending loads. Added to this are the thermal loads from cold to optimum temperatures. Then there is the phenomenon of skirt flexing and the ability of the skirt to act as a spring without fatigue.

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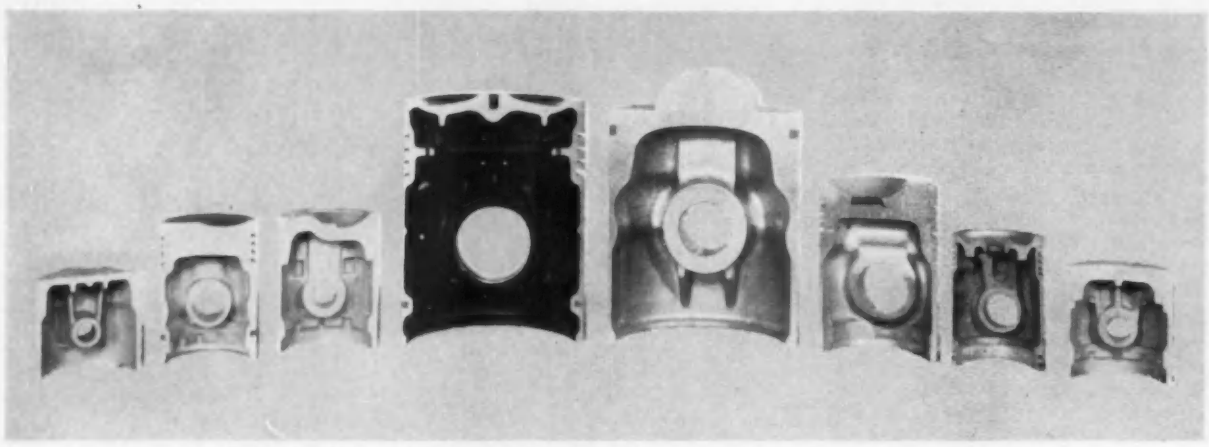
* Registered Trade-Mark.



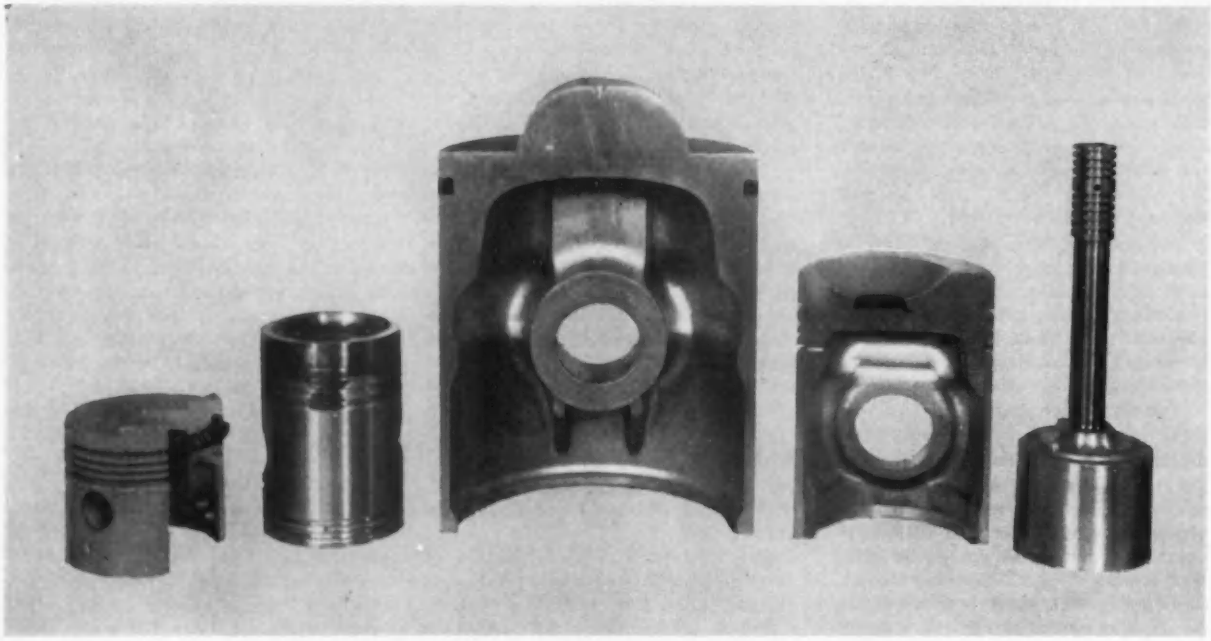
3. Gillett & Eaton show here a few of the varieties of pistons they produce, indicating the endless variations in internal configuration and dome shape required to suit production engines.

There is still another aspect of piston pin arrangement, again with divided practice. Some engine designers prefer to offset the pin in the direction of maximum thrust loading, the amount varying from zero up to about 0.90-in. Others leave the pin in the center. Both types of pistons appear to work satisfactorily in the specific engines. How, then, do you judge whether one is to be preferred, except for the preference of an individual designer?

Incidentally, a comment is in order on the so-called slipper piston. Originally and for many years, pistons were rather simple and of full trunk type. However, the introduction of short stroke engines — square and oversquare — with respect to stroke changed this picture radically. Most modern engines must have a slipper skirt to provide adequate clearance with the crankshaft counterweights.

Thus the designer and the engineering consultant start with two basic parameters in appraising the needs of a new engine. The first is compression clearance height which defines the distance from the center of the piston pin bosses to the dome. The second is the amount of skirt length and shape that is left after counterweight clearance has been defined. There is some question now as to the role of the shirt-tail left on the skirt. Some question as to whether this can be removed without affecting the stability of the piston in the bore.

Meanwhile, all piston producers are working on advance developments not only in piston design but in the way they are manufactured. For example, the overwhelming practice is aluminum alloy pistons made by the permanent mold method. But there are some, as in the case of Thompson-Products Div., who are devoting considerable effort at the manufacture of impact extruded pistons. And we understand that some work is under way in the hope of producing larger aluminum pistons by die-casting, a



4. Another group of Gillett & Eaton pistons, featuring a variety of dome configurations, with and without inserts. The piston at the extreme left shows the character of the wire insert employed in the top ring groove.

much faster process than permanent mold casting.

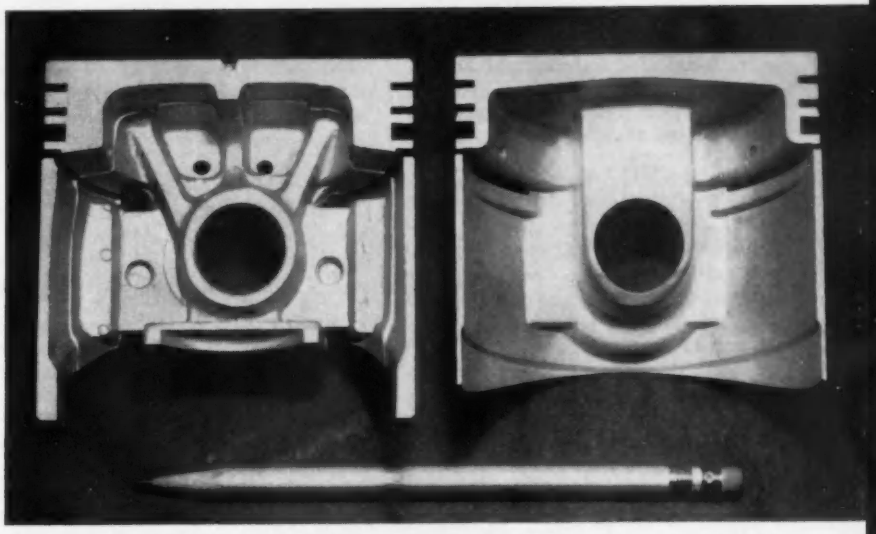
We learn too that Alcoa is conducting a great deal of work aimed at the compatibility of aluminum pistons in aluminum bores. This stems from the current interest in aluminum engines, particularly the future development of all-aluminum cylinder blocks without steel or cast iron liners. If the cylinder bore is of high silicon alloy, what kind of alloy is required for the piston; or if a piston is made of high silicon alloy, what kind of composition will be required for the bore? These are some of the questions being studied in Alcoa's Cleveland research laboratories.

A development of fairly recent origin already is exerting some effect upon the kind of metal that can be used in making passenger car pistons. We refer to the three aluminum foundries—Ford at Sheffield, Alabama; Chevrolet at Messana, N. Y.; and the GM Central Foundry operation in Arkansas—which are established in conjunction with adjoining Reynolds Metals reduction plants. As described in AUTOMOTIVE INDUSTRIES at various times, these foundries use virgin aluminum in the hot molten state delivered directly from the reduction plant. Each of these facilities has a permanent mold piston department and in each instance the pistons are of virgin aluminum rather than the secondary alloy generally used by all other foundries.

Let there be no misunderstanding about this. The vast majority of pistons made with secondary aluminum have demonstrated adequate life and exceptional performance. There is no question about their ability to live in modern engines. The point is that the three foundries mentioned above find it more economical to use the available virgin metal, whereas the majority of foundries must continue to melt secondary metal in the interest of cost economy.

The material that follows is a brief commentary on a selected group of suppliers:

ALUMINUM COMPANY OF AMERICA (Alcoa)—doubtless is the oldest name associated with the development of aluminum pistons. This is quite natural considering that the company was the prime supplier of aluminum in the beginning of the industry. In this situation Alcoa was called upon to pioneer in the design and manufacture of aluminum pistons, much of the development being done at the laboratories in Cleveland. One of the most significant of the early breakthroughs was the introduction of the Lo-Ex alloy around 1929. This was followed around 1932 with the innovation of the T-slot construction for controlling skirt geometry.



5. This photograph compares the design of a Bohn Autothermic permanent mold cast piston (left) and the Thompson-Products impact extruded piston (right).

Alcoa operates permanent mold piston foundries in Detroit and in Cleveland. Detroit handles all passenger car engine business; Cleveland produces heavy duty pistons. In addition, Cleveland makes the smallest sized pistons for industrial applications, and die-cast pistons for lawn mower engines. Besides this Alcoa also makes forged pistons for aircraft engines and where unusual requirements must be met.

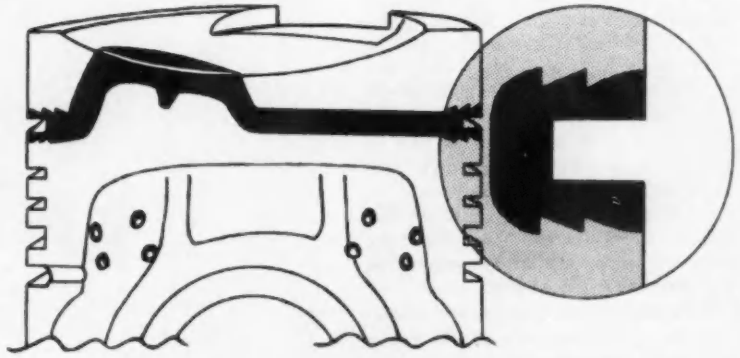
Most commonly used alloys are designated as F-132, A-132, and 142.

Alcoa is noted as a consultant to engine builders and designers since the inception of aluminum piston practice. This service is available on any engine component or indeed on complete engines. The Cleveland laboratories are unusually well equipped to this end with facilities for dynamometer testing, road testing, and stress analysis. Engine dynamometer laboratories are equipped with three test stands and a cold room for testing engines to minus 40 F.

Stress analysis has two aspects: stresscoat work and strain gage analysis.

It is only natural that advance research is being conducted as an adjunct to the activity of the laboratories on current problems. One project, as mentioned earlier, deals with material compatibility in future engines. In addition, they are investigating special features, one example being the value of a stainless steel dome insert.

Among other activities of the com-



6. Here is an enlarged view of the Dualoy piston with the molecular bonded Ni-Resist head insert which also armors the top ring groove. This is a proprietary construction used by United Engine & Machine Co.

pany was a series of symposiums dealing with then current piston design. Results of the meetings held in Cleveland in 1953 were summarized in a technical brochure published by Alcoa at the time.

BOHN ALUMINUM & BRASS CORP. —is the originator of the Autothermic piston which has been used in passenger car engines for over 35 years. An extensive article describing this design principle was prepared by P. M. Heldt and published in AUTOMOTIVE INDUSTRIES, Sept. 19, 1936.

Latest development deals with pistons for Diesel engines with bores less than 5-in. in diameter, employing the Autothermic principle to provide closer fits than have been considered feasible heretofore. Tighter controlled fits are said to produce less cocking of the piston in the bore, hence should result in less friction; less sleeve vibration; and better piston ring attitude, i.e., improvement in blow-by and oil control.

The special engineering services to engine builders have been augmented and still better coordinated with foundry and machine shop operations, stemming from the recent move which has concentrated engineering and manufacturing in South Haven, Mich. Recently Bohn added hypereutectic alloys to the available list of piston alloys, thus expanding its scope to engines of any size and any type. The Autothermic principle has been extended to aircooled engines as well as to the other types.

It may be of interest to review afresh some of the distinctive characteristics of the Autothermic principle. Fitted with less than 0.001-in. clearance in the bore at room temperature, the piston will contract less than the cast iron bore and will be free from slap at cold starting temperatures. Conversely, the piston will expand less than the cast iron bore at operating temperatures.

Secret of such behavior lies in an action similar to that of a bi-metallic thermostatic element. In the Bohn piston this stems from the use of steel struts, steel stampings employed as inserts. Figures 1, and 2 show the shape and location of the struts. The steel strut is so proportioned and so located that any temperature rise causes expansion along the piston pin axis at a greater rate than for the cylinder bore. On the other hand, the expansion along the thrust axis is less than for the cylinder bore.

As a result, the cam ground piston with its minor diameter at the piston pin bosses at room temperature becomes round or nearly round at operating temperatures.

According to Bohn two types of Autothermic pistons are commonly used. One is the open type which has a transverse slot through the upper skirt below the oil ring grooves. This provides maximum cold slap control with a close fit in the bore. The other is the closed type, featuring a sawn or milled slot in the center of the oil ring groove. This design develops maximum durability and enables the use of a minimum compression height.

GILLETT & EATON — demonstrates amazing versatility in the kinds and sizes of pistons within its capabilities. One example of range is that pistons have been produced as small as one-inch in diameter, weighing but one-oz, to some as large as 28-in. in diameter, weighing up to 460-lb. Pistons are being supplied for use in single- and multiple-stage compressors; for two stroke engines, both gasoline and Diesel; for four-stroke engines for tractors, trucks, and stationary equipment, burning gasoline or Diesel fuel, or multi-fuel.

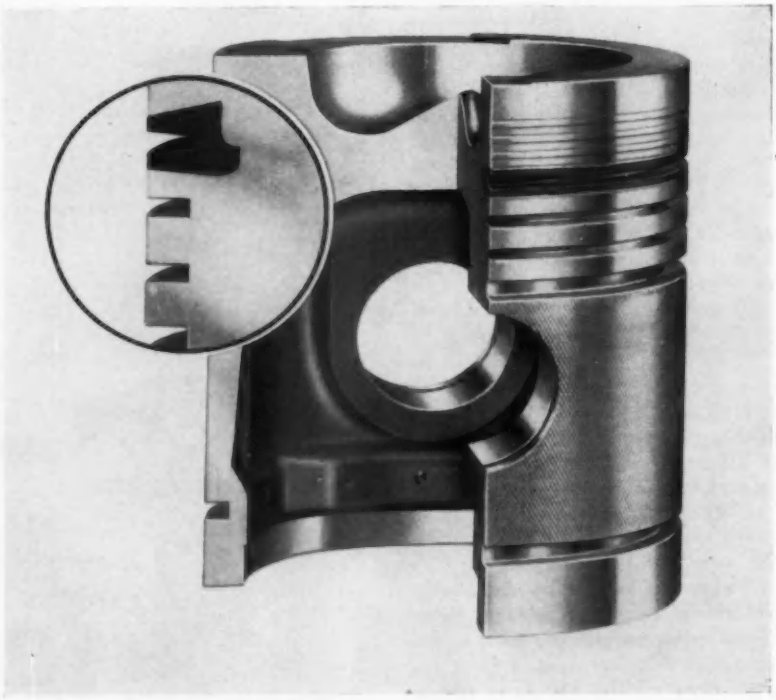
The company fabricates pistons in all of the standard aluminum alloys; also produces the Vanasil piston—a patented hypereutectic aluminum alloy with excellent high temperature characteristics. However, activity is not limited to these specific alloys. In initial studies of a new application the company is prepared to tailor pistons to fit the special requirements of an engine from the standpoint of hardness, tensile strength, and other properties. It may be noted in this connection that G & E has continued the manufacture of pistons from five basic irons, ranging from common gray iron to high alloy irons with tensile strength up to 53,000 psi.

Gillett & Eaton is among the relatively smaller group of piston suppliers offering special engineering consulting service to the engine builders. And its manufacturing facilities are capable of meeting a customer's requirements from the standpoint of versatility of method, low cost, and quality.

Where it is necessary to experiment with pistons of a variety of configurations, G & E is prepared to produce samples by sand casting or semi-permanent-mold techniques. This is in addition to conventional permanent mold procedures employed in making large volume aluminum pistons. Out of this variety of facilities the company is able to offer relatively low cost experimental procedures.

After a piston design has been tested by the customer and has been accepted, G & E provides pattern shop and tool room facilities for the production of practically any kind of mold or pattern. Moreover, the company has extensive machine shop facilities and can supply finished pistons if desired.

If a customer's needs lie beyond that of aluminum or cast iron, G & E can employ its machine shop facilities



7. Example of a special diesel piston supplied by Zollner. It typifies the Bond-O-Loc ring groove design; also highlights the special knurled or serrated skirt.

for finishing ductile iron or nodular iron pistons cast in specialty foundries.

Besides the conventional piston designs, G & E has worked extensively in the development and production of bimetal pistons incorporating an all iron head and either an aluminum or Vanasil skirt. The company, too, is prepared to supply any suitable form of surface coating—tin, Parco-Lubrite, or an anodized finish.

G & E has developed unique piston designs, many with open chamber heads in a variety of configurations—deep cup, eccentric cup, turbo-dome, open head, and two stroke head designs with or without plug inserts. There are endless variations of internal and external configurations, depending upon the requirements of a specific engine. Figure 3 shows some of the varieties of internal construction; Fig. 4 pictures some of the varieties of plugs and inserts that can be developed.

Noteworthy is the unique Wire Insert, bonded into the top compression ring belt to prevent wear and pounding in heavy duty applications. Its design is such that it does not dam up heat transfer, thus permits a faster and greater rate of heat transfer. This feature may be seen in Fig. 4 in the piston at the extreme left. Other piston designs incorporate Ni-Resist and cast iron groove inserts; and where engine design and fuel injection make such features necessary, also incorporate a cast iron insert in the piston dome. Besides being mechanically locked, each insert is also metallurgically bonded to the castings.

THOMPSON PRODUCTS LIGHT METALS DIVISION—is a supplier of permanent mold cast pistons in both the plain aluminum design and with the T-P cast-in steel belt for thermal control. More recently, however, the company has developed a forged aluminum piston, Fig. 5 (using the same composition as for cast pistons) which is said to have excellent characteristics. Reportedly, the forged piston has been supplied to Pontiac for a super-duty engine kit; and to Chevrolet for high output engine options.

The company also has been working on development programs with Diesel and gasoline truck engine manufacturers who have become interested in the unusual physical properties of the forged piston.

The impact extrusion process, being exploited by T-P, is essentially one that exerts tremendous pressures on an aluminum slug to produce a finished piston. According to the Company, the consistent density of the piston due to the high impact forging process provides a uniform heat conductivity throughout the piston, offering good properties in this very important area. Impact extrusion creates a new, dense grain flow in the metal being worked and gives high strength qualities and uniform metal density throughout the piston.

The grain flow structure also strengthens the piston skirt while at the same time giving the skirt flexibility. The grain flow up and down the skirt is said to make it resistant to scuffing. With elongation of 6-8 per cent, the pistons have the ability to elongate without failure even though the material has been stressed beyond the elastic limit. This contributes to long life as well as resistance to breakage and cracking.

Thompson engineers report they can produce the forged pistons with cast iron inserts, ni-resist inserts in the top groove and other special requirements in the Diesel field. They also say that the forging process can be used to produce intricate piston crown shapes so accurately as to eliminate or minimize machining of this surface. The forging process also holds to tolerances of between 0.005 and 0.010-in. on inside surfaces of the piston, thus making chucking easier for machining on the outer surfaces. Impact extrusion also holds close weight control and with the close tolerances, only low balance pad requirements are needed.

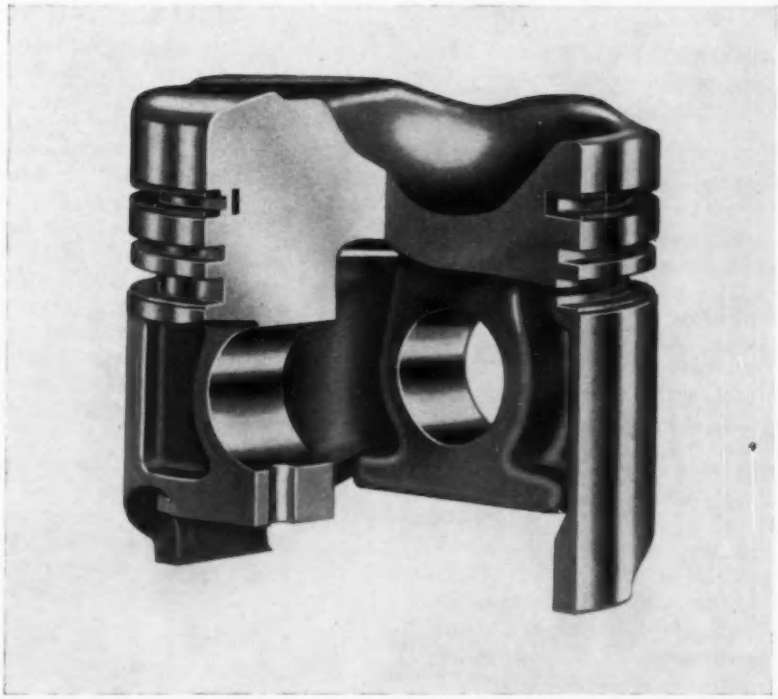
UNITED ENGINE & MACHINE CO.—produces a line of pistons for passenger cars; and for heavy duty gasoline, LPG and Diesel engines. The general line of strut type pistons is marketed under the trade name Silv-O-Lite, made by permanent mold casting from F-132 aluminum alloy. The same alloy, unless otherwise specified, is used for making the Dualoy, bimetallic molecular bonded pistons for Diesel and heavy duty engines.

The Dualoy design employs a large cast insert of Ni-Resist for armoring the top ring area. This insert is bonded both chemically and physically through use of the Al-Fin process, see Fig. 6.

ZOLLNER CORP.—has had the unquestioned reputation for many years as an outstanding source of aluminum pistons for heavy duty service in engines for motor trucks and buses, off-highway equipment, marine, industrial applications, etc. Since 1955 when its new foundry was placed in operation the company has also participated in supplying pistons for passenger car engines and compressors as well.

Zollner is said to produce a major share of heavy duty pistons in the USA, and exports pistons all over the free world for replacement in US-built engines.

Currently the company makes aluminum pistons in diameters ranging from 1⅞ in. to 9-in., the larger per-



8. This Zollner piston illustrates the principle of the Continuous Perma-Groove top ring groove insert which is made from a stamping. This is a lower cost construction suitable for lighter duty engines.

centage ranging from 3½-in. to 6½-in.

All Zollner pistons are made of aluminum by the permanent mold technique, employing F-132 and A-132 alloys for production pistons. The F-132 alloy is essentially the same as is commonly used in the industry, except for the addition of about 0.5 per cent nickel. This addition is said to improve machinability and to effect some improvement in high temperature characteristics. Pistons for Diesel engines are produced from the A-132 alloy exclusively. This is a premium alloy containing 2.0 to 3.0 per cent nickel for improved high temperature characteristics; also differing from the F-132 alloy in the content of copper and silicon; and subject to even closer control of composition.

The company has pioneered and exploited a number of unique features of basic piston design over the years to improve performance and durability. These may be summarized briefly as follows:

First of these is the Bond-O-Loc cast-in insert to alleviate the vexing problem of top groove pounding and erosion in heavy duty engines. As illustrated in Fig. 7, it consists of a single Ni-Resist casting of wedge section, Al-Fin-bonded to the piston casting. Scallops on the inner surface combine with the wedge section to provide a mechanical lock. Bond-O-Loc has been employed for many years in pistons for many Diesel engines as well as a few of the more expensive gasoline engines.

While the mass-produced heavy duty gasoline engines also require groove inserts, cost considerations are so important that it is necessary to effect this by some lower cost means. For such applications Zollner developed the Continuous Perma-Groove insert, a stamped steel insert cast in place without bonding. As seen in Fig. 8, it is securely locked in place by its shape, by dove-tailed edges, and by the forces resulting from the difference in thermal expansion. In most applications the insert is made of two stampings spot-welded together; in a few cases a single stamping is employed to protect only the top surface of the ring groove.

These stamped inserts have been in use for several years and are said to have demonstrated the ability of living under severe operating conditions, with exceptional endurance even when subjected to severe detonation. This insert has been tested successfully in Diesel engines as well.

The third basic proprietary feature is the Clear-O-Matic method for controlling skirt expansion. It provides a rate of thermal expansion substantially the same as that of the cylinder bore through the use of a cast-in steel member of proper proportions, Fig. 9, which bears outward near the top of the skirt. In this design the skirt is separated from the ring belt by horizontal slots on the thrust sides.

Skirt expansion is said to be controlled so accurately and effectively that the pistons can be installed in heavy-duty engines with a skirt-to-bore clearance of only 0.001-in. This type of piston has high physical properties and is recommended both for passenger car and heavy-duty gasoline engines.

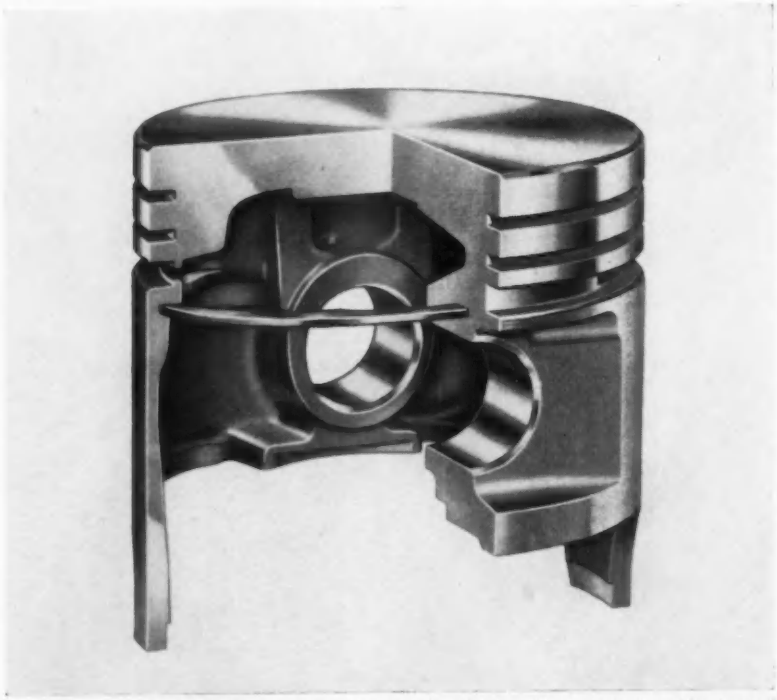
As designed by Zollner, typical passenger car pistons are of slipper type with horizontal slots in the skirt area. Because of cost considerations and high operating speeds, the tendency has been to lighter weight pistons for passenger cars. Nevertheless, current pistons still have to have fairly rugged construction in keeping with the high compression ratios and consequently higher loading. Zollner's experience in the heavy duty field has made it possible to improve passenger car pistons without radical weight increase.

Pistons for current gasoline truck engines (particularly engines converted from passenger car versions) are similar to those used in passenger car engines but frequently specify Continuous Perma-Groove inserts and tend to have somewhat thicker sections throughout. The Clear-O-Matic skirt feature, too, is popular.

Diesel pistons, generally speaking, have thicker sections and employ trunk type construction (without slots) for optimum strength and good heat transfer. Many of these employ Bond-O-Loc inserts. Slotted pistons are not recommended for such engines, although they have survived endurance tests in some. In general, the slotted piston in Diesel engine service tends to aggravate structural and thermal problems and increases the probability of failures in service.

Zollner manufactures several hundred different kinds of pistons, necessitating the development of flexible tooling which is quickly adaptable to the variety of sizes and types. Single purpose, automated tooling is economical only on those part numbers that are required in large volume.

It is noteworthy that Zollner offers a specialized engineering service to the industry through the employment of specialists with years of know-how in the design of pistons, rings, cylinder bores, and considerable experience with engines. Among the engineers are some who were previously connected with manufacturers of engines, pistons, piston rings, cylinder liners, and associated parts. Although the company is a specialist in the making of permanent mold pistons, experimental work is carried on in other directions with investigations in the field of forgings and extrusions as well. ■



9. The Zollner Clear-O-Matic principle of bi-metallic skirt control is illustrated in this view. This steel ring design makes it possible to fit pistons with a clearance of 0.001-in. with the bore without slap.

News of the MACHINERY INDUSTRIES

Machine Tool Builders, at NMTBA's 59th Spring Meeting Held in Washington, are Briefed by Government Officials on Modernization Assistance Programs of New Administration

By Charles A. Weinert

Machine Tool Builders Meet with Government

With a setting in Washington, D. C., the 59th Spring Meeting of the National Machine Tool Builders' Association was programmed around Government activities. Its purpose, as expressed earlier by Ludlow King, executive vice-president of NMTBA, was "to learn how our membership can be most effective in supporting President Kennedy in his desire for a stronger America."

The builders learned first-hand about the plans of the new administration; and Government officials became better-acquainted with the machine tool builders.

Basically, an exchange of information took place in a cooperative effort aimed at modernizing America's production facilities. The speakers repeatedly stressed recognition of the utmost importance and necessity of up-dating plant and equipment. There was unanimous agreement that modernization is a "must" to continuance of America's economic strength, to meet world-wide competition, and to maintain adequate defense.

Guest speakers at the conference, held early this month, were the Assistant Secretary of the Air Force, Commissioner of Internal Revenue, Assistant Secretary for Domestic Affairs, and Director of the Office of Civil and Defense Mobilization. Also the Chairman and President of the Export-Import Bank of Washington, Administrator of Small Business Administration, and Special Assistant to the Director of International Cooperation Administration.

NMTBA's president, Everett M. Hicks, was of course the presiding officer, as well as one of the principal speakers.

Subjects included Government tool replacement programs, depreciation, Eximbank financing, small business, and foreign aid. Some of the highlights of the meeting follow:

While Mr. Hicks was not the opening speaker, he set the stage in the "Report of the President," by saying, in part:

"It is increasingly clear we are engaged in a war for survival. . . . The only hope of averting a nuclear war is that the Communists will be fearful enough of the consequences not to start one. If this does occur, we are still engaged in a war for survival, but this war will be fought on the economic front. The battle of the '60's is one of productive efficiency and competition for world markets. . . .

"The United States (1) leads the world in the development of machine tools; (2) is supplying a dwindling percentage of machine tools to world markets; (3) has more obsolete machine tools now than at any time since the 1930's; (4) is utilizing only a fraction of its machine tool producing capacity while other nations are operating at full capacity with large backlogs; (5) permits the lowest rate of depreciation for new investment of any of the eight major free-world industrial nations. . . .

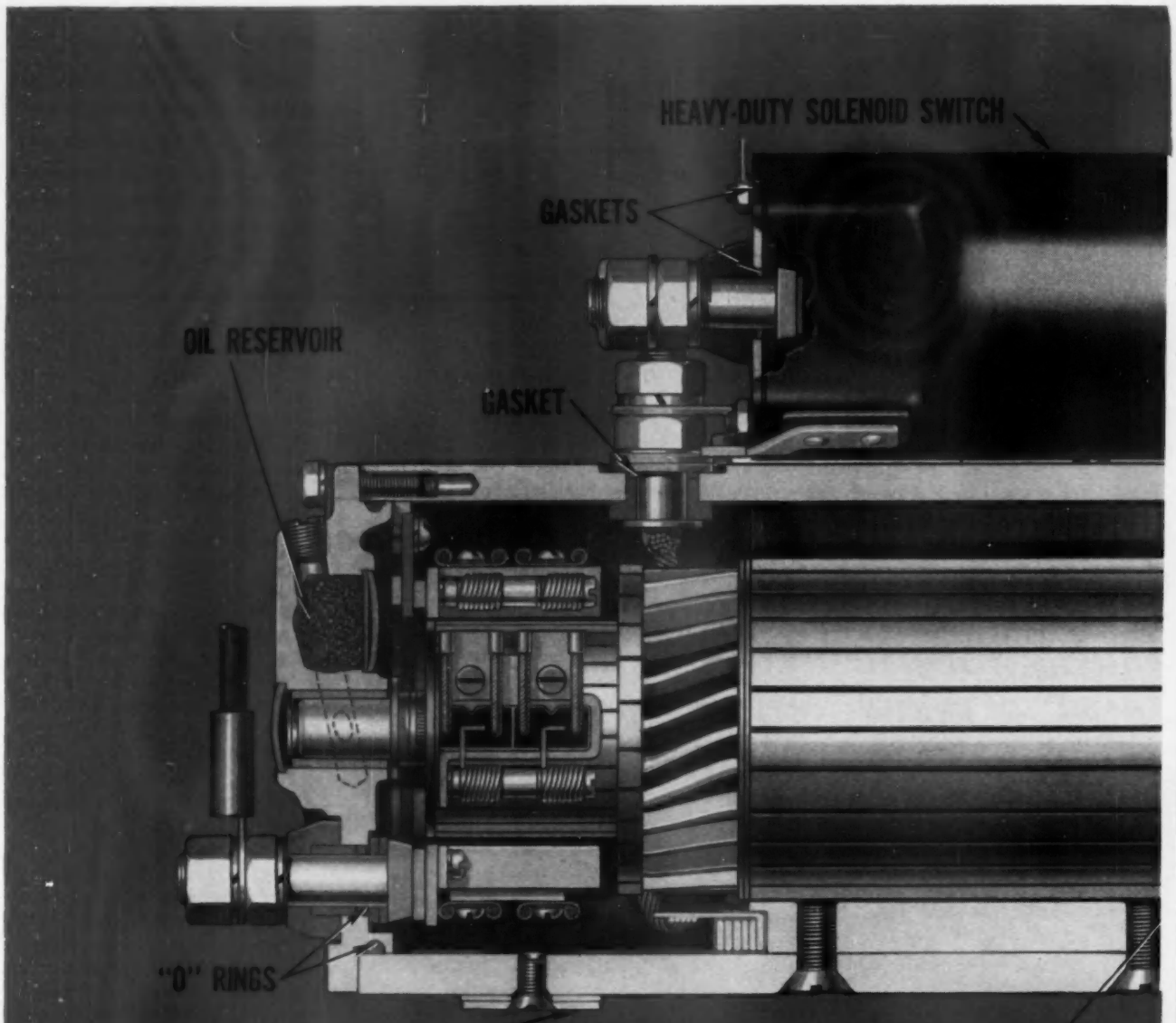
"If we are to survive, we must compete; and if we are to compete, we must be efficient and have low costs."

Three steps for up-grading America's industrial facilities "against the backdrop of a rapidly developing obsolescence of industrial plant and a highly competitive world" were discussed by Hickman Price, assistant secretary for domestic affairs, Department of Commerce. He mentioned as offering some benefits along this line the tax incentive plan recommended by President Kennedy. Secondly, he advised that the Department of Commerce has been exploring a plan for assisting the financing of machine tools through normal private channels. It might be in the form of credit insurance. Third, Mr. Price suggested the setting up in industry of a "massive" research program—on pure research as contrasted to commercial product research—developed within the Government in cooperation with industry. He added the thought that he hoped the fiscal authorities would give consideration to special tax incentives applicable in such instances.

In a talk entitled "The Air Force Machine Tool Modernization Program," presented by Joseph S. Imirie, assistant secretary of the Air Force (Materiel), it was indicated that more and more of the replacement machines procured by the Air Force will be numerically-controlled. Mr. Imirie said, "We actually need few machines designed for high production; instead, we need more versatility for small lot runs . . . . We are considering a program which, over the next 10-year period, would call for a reduction of conventional machines by over 40 per cent to a level of about 30,000. During this period, if this program is adopted, we would acquire about 5000 modern machines, many of which will be numerically-controlled."

Mortimer M. Caplin, commissioner, Internal Revenue, pointed out that President Kennedy's investment tax credit plan will not prejudice such depreciation reform as may be required to achieve the overall objectives. Further, that the President's plan represents an im-

(*Turn to page* 136, *please*)



Another first from Delco-Remy!

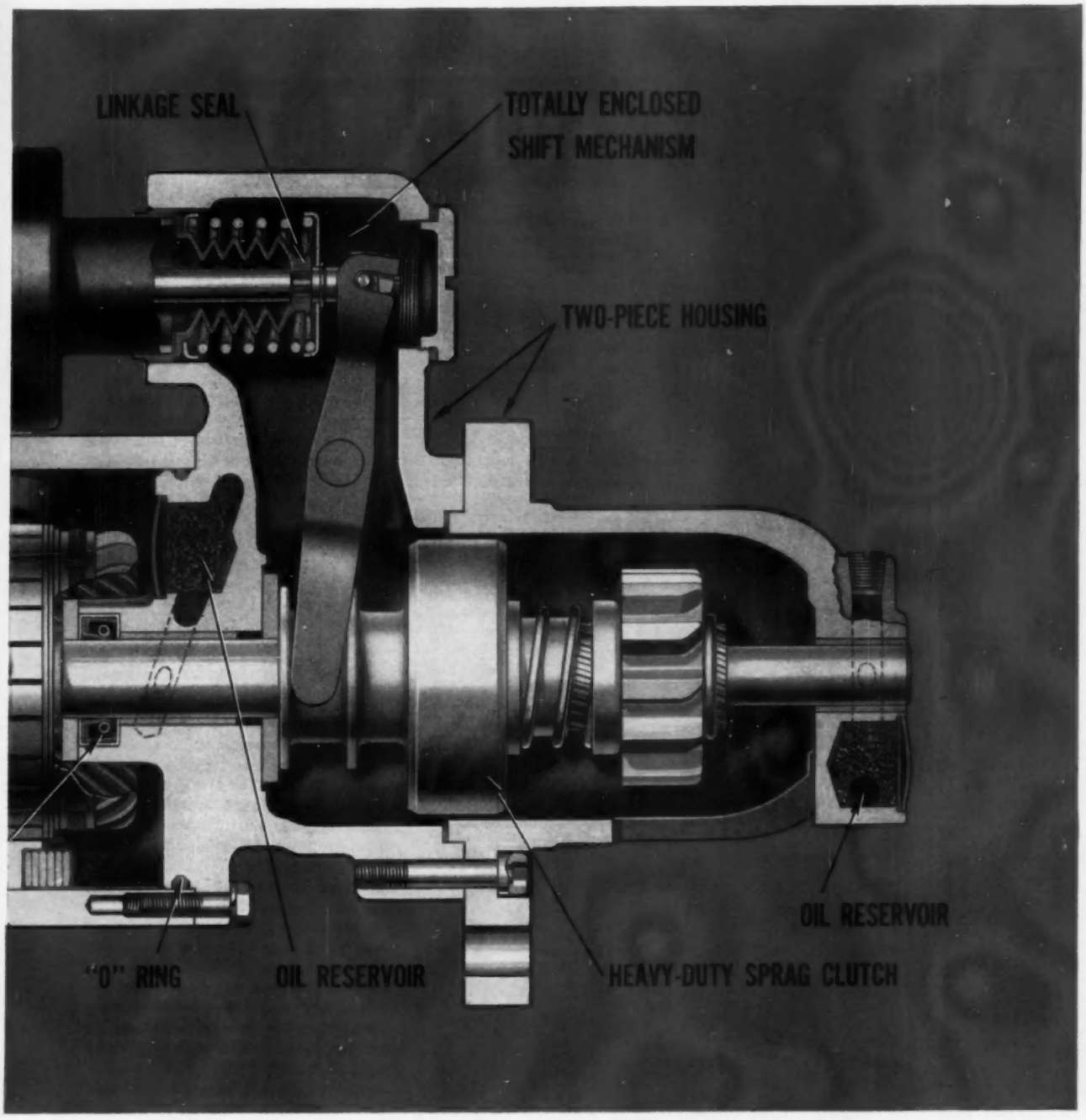
NEW DELCO-REMY HIGH-OUTPUT MOTOR

Completely new series of high-output cranking motors! These 12-volt motors have the torque and speed to do the same job as 24-volt motors of equal size *and on the same battery power.* No need for series-parallel switches and their complicated wiring on engines up to 900 cubic inches. These solenoid-operated, over-running clutch type heavy-duty cranking motors come with special two-piece drive housings that permit 24 different motor mounting positions. Their new 50% longer brushes, together with sealing rings (optional) and large oil reservoirs (optional), assure extra-long operating time between overhauls.

TOTALLY ENCLOSED DRIVE SHIFTING MECHANISM is protected against dirt, water, slush and ice. This enclosure, plus the shaft seal and linkage seal, also blocks transmission oil leakage into the motor and solenoid.

TWO-PIECE DRIVE HOUSING DESIGN permits 24 different solenoid positions which allows greater standardization—cuts fleet inventories. Nose housings are available in S.A.E. #2 and #3 mountings.

HEAVY-DUTY SOLENOID AND SWITCH provide positive pinion engagement and safely handle maximum starting current. Special seals keep out foreign material and allow increased contact life.



ELIMINATES SERIES-PARALLEL SWITCHES

SPRAG CLUTCH DRIVE operates with non-chamfered ring gear. Pinion indexes on spiral spline, positively engaging ring gear before power is switched on. Engagement of the pinion and ring gear is maintained during intermittent or sporadic engine firing.

HEAVY BRUSH INSPECTION PLATES resist damage from use and handling—are sealed to prevent leakage.

Engine manufacturers are invited to write directly to Delco-Remy for complete information and engineering assistance on the specific application of these new motors.

Fleet owners should specify this motor for new trucks through their truck dealers.

FROM THE HIGHWAY TO THE STARS

Delco-Remy
electrical systems

GM GENERAL MOTORS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, IND.

Circle 141 on Inquiry Card for more data

NEW PRODUCTION and PLANT EQUIPMENT

By C. J. Kelly
ASSISTANT EDITOR

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

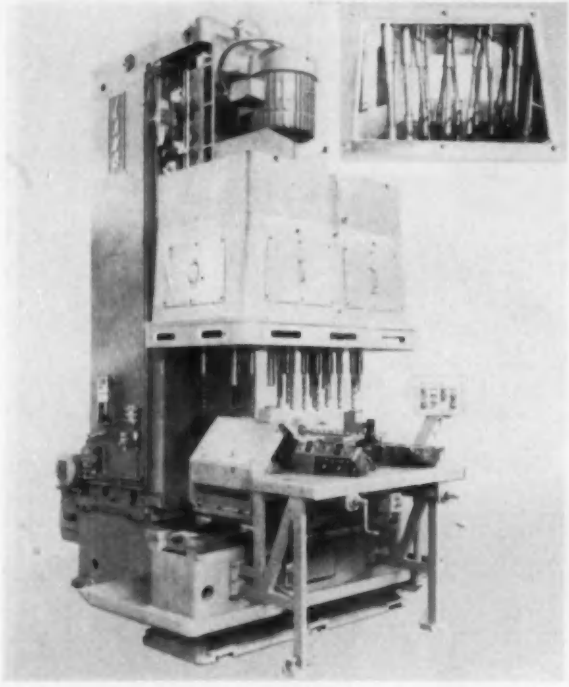
Drill Holder Bushings

Low cost, split-type bushings have been developed to fit all screw machine drill and floating holders. They are designed to permit the bushing to grip the tool around ¾ of its circumference for an accurate fit.

Bushing has segment retaining springs to keep it from coming apart and permit easy insertion and removal of the tool. The bushings are made from carburizing steel, which is ground after heat treating. Available sizes include all letter, number and fractional drill sizes from number 80 to 63/64 in. *Mueller Industries.*

Circle 40 on Inquiry Card for more data

Slip Spindle Drilling Machine



This unit has a two position shuttle which carries two fixtures. Parts are processed from the first to the second fixture with progressive operations performed at each work station. The machine is composed of standard building blocks. The drill head and shuttle are actuated hydraulically and are carried on hardened and ground tool steel ways.

Circle 42 on Inquiry Card for more data

A 4-STATION, shuttle type, slip spindle drilling machine is one of twelve machines that form a new segmented production line for processing cast iron, V-8 or six cylinder truck engine heads.

Features of the drilling machine are typical of other reaming, tapping, spotfacing, milling, chamfering and boring units in the line — most of which perform combination operations. The basic design accommodates present production requirements of approximately 25 parts per hour and it provides for quick retooling for planned and eventual product design changes.

The machine column, column base, way type shuttle, drill head and universal housing are Lamb standard building blocks. The slip spindle plate was bored to suit the present hole pattern. The machine has 16 slip spindles but the drill head is equipped with 24 drives to accommodate hole pattern changes and/or additional holes in future workpieces. All machines in the line are equipped with extra drives. The spindle plate can be changed without disassembly of the head or universal housing. Removable cover plates provide access to the universal shafts. *F. Jos. Lamb Co.*

Barrel Finishing Unit

ELECTRATILT, a new barrel finishing unit, features automatic electrical tilting of the barrel from 40 deg above the horizontal to about 35 deg below the horizontal. Tilting is accomplished by means of a standard gearmotor used in conjunction with a standard chain drive. A selector switch controls the direction of tilt and limit switches hold the tilting motion of the barrel at the selected positions. Turning the selector switch button to the neutral position allows tilting to be stopped at any point between extremes. *Baird Machine Co.*

Circle 41 on Inquiry Card for more data

12 in. Lapping Machine

SPEEDLAP is the designation given a new 12 in. lapping machine which has been designed for compactness and economy. The new unit is constructed of stainless steel and features a reversible lap plate.

This lapping machine was designed with four 4½ in. ID rings to eliminate much pre-grinding. The abrasive compound is applied automatically. The manufacturer reports the Speedlap 12 is ideal for laboratory work, short production runs and production of small parts. Typical production features are that it produces flatness to 0.000003 and better with surface finishes 2 R.M.S. Parallelism tolerance can be held to 0.000050. *Speedlap Corp.*

Circle 43 on Inquiry Card for more data

Welding-Trimming

TWO new machines for production welding and flash trimming automotive ring gears have been introduced. One, called the number 25 flash welder, is rated at 150 KVA and is fully automatic in operation.

The number O oscillating flash trimmer, hydraulically actuated, is also fully automatic. The flash welder clamp fixtured are designed to align both ends of the ring in a single motion. The tooling on the trimmer is adjustable over a range of sizes. *Swift Ohio Corp.*

Circle 44 on Inquiry Card for more data

Tool Presetting

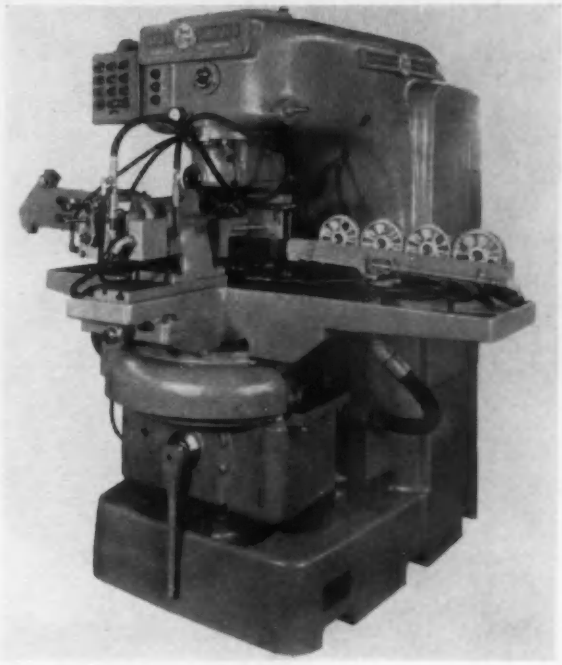
CUTTING tools can be preset for both diameter and depth by the utilization of a new instrument called the precision tool presetting machine. The unit was designed to preset cutting tools to rigidly accurate tooling requirements of numerically-controlled machine tools.

The unit measures 46 in. long, 44 in. wide and 50 in. high. The device has a tool setting capacity of 8 in. diameter maximum, and 18 in. depth maximum (from gage line in the taper socket).

In addition to cutting tools, drills, boring bars, milling cutters and other accessory tooling can be set on the machine. A Bausch & Lomb 40-power, illuminated microscope with special cross hair reticule is mounted on the slides for optical sighting of the tool point. *Microbore Div., DeVlieg Machine Co.*

Circle 45 on Inquiry Card for more data

Automatic Loader permits Handling of Large Gears



An in-line type of Red Ring automatic loader permits straight line flow of gears through a conventional rotary gear shaving machine. The new design makes available a second method of automatically processing gears through a shaving machine on automated lines. The conventional method infeeds and returns shaved gears at the front of the machine. The new method feeds gears in a straight line across the machines, or through a battery of machines. The manufacturer reports the new method allows handling of larger gears than possible with a shaving machine of equivalent size. National Broach & Machine Co.

Circle 46 on Inquiry Card for more data

Automatic Radiator Seal

AN automatic automobile radiator soldering machine and a supply tank soldering machine have been developed to provide better quality soldered joints together with predictability and repeatability.

The new machines are designed to produce radiator assemblies at a variable production rate. The calculated maximum capacity of the radiator machine is 206 per hour at 80 pct efficiency and the calculated maximum production rate of the supply tank machine is 238 per hour at 80 pct efficiency.

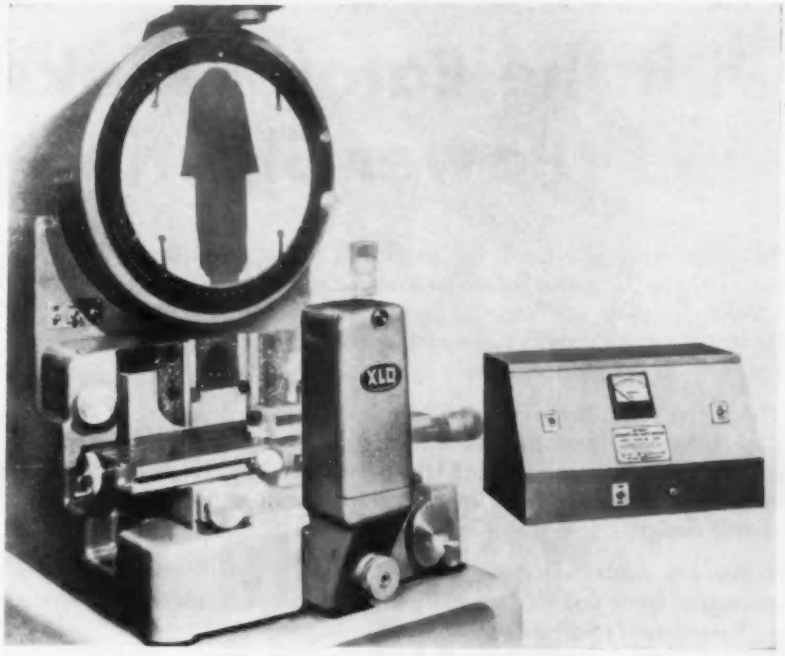
The radiator machine automatically solders two tanks and the two side support brackets to the radiator core.

The 34 ft by 12 ft by 12 ft high machine is essentially a self-contained transfer-type machine incorporating 18 vertical fixtures which form a continuous loop or production line with minimum transfer time and supervision. Radiators are hydraulically clamped in the fixtures and the fixtures indexed linearly between work stations. The fixtures are also automatically pivoted in the vertical plane so that soldering of the radiators always occurs in down-hand fashion.

Versatility is an important design feature of the radiator soldering machine in that the fixtures are adjustable for height and width to accommodate different size radiators. *Expert Welding Machine Co.*

Circle 47 on Inquiry Card for more data

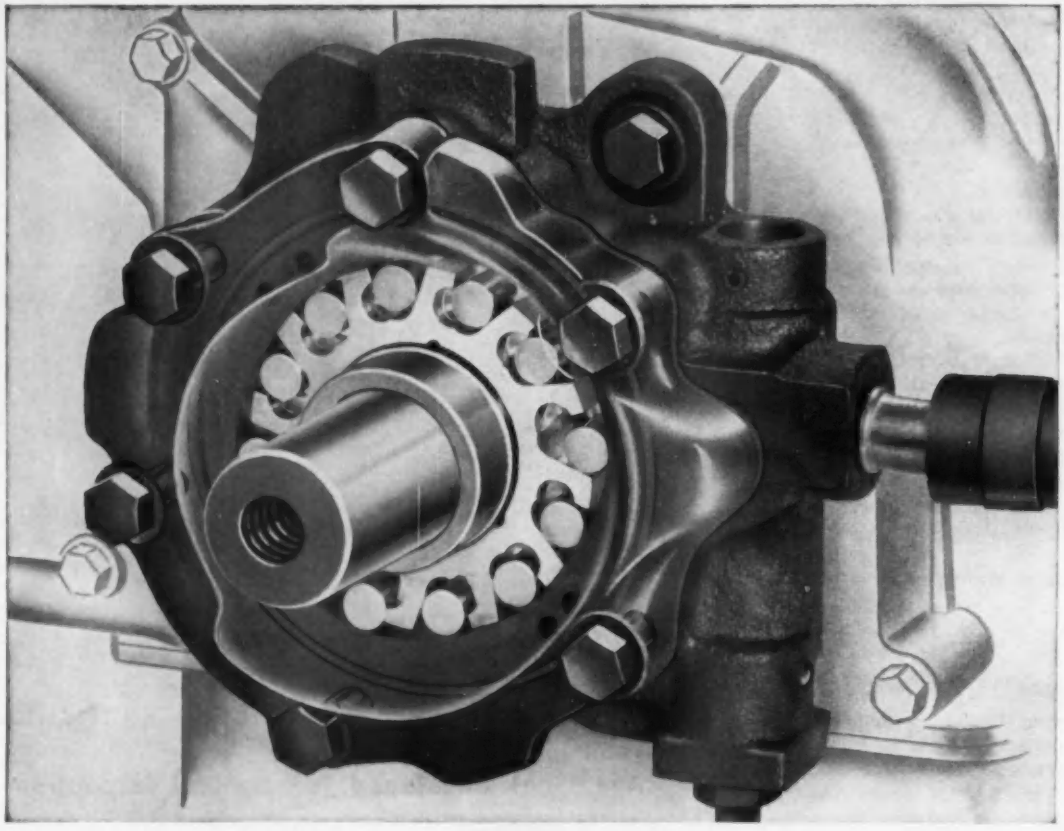
Arc Light Developed for Optical Inspection



New mercury arc light equipment has been developed to give greater clarity and sharpness to the image of the part to be inspected. The mercury light, according to the manufacturer, has an intrinsic brightness 45 times that of standard tungsten filament. The manufacturer recommends the light for magnifications of 20X and over on 14 in. projectors and 50X and over on 30 in. projectors. The new light can also be used at lower magnifications by setting a switch on the power supply unit to "Low Intensity." Ex-Cell-O Corp.

Circle 48 on Inquiry Card for more data

MORE SPACE FOR ACCESSORIES



with the Eaton Crankshaft-Driven Power Steering Pump

By eliminating the need for mounting brackets, pulleys, and v-belts, the Eaton Direct Crankshaft-Driven Power Steering Pump saves valuable under-hood space. The oil reservoir is remotely mounted—out of the way. Direct crankshaft drive provides power for steering under all conditions; eliminates the need for belt adjustments.

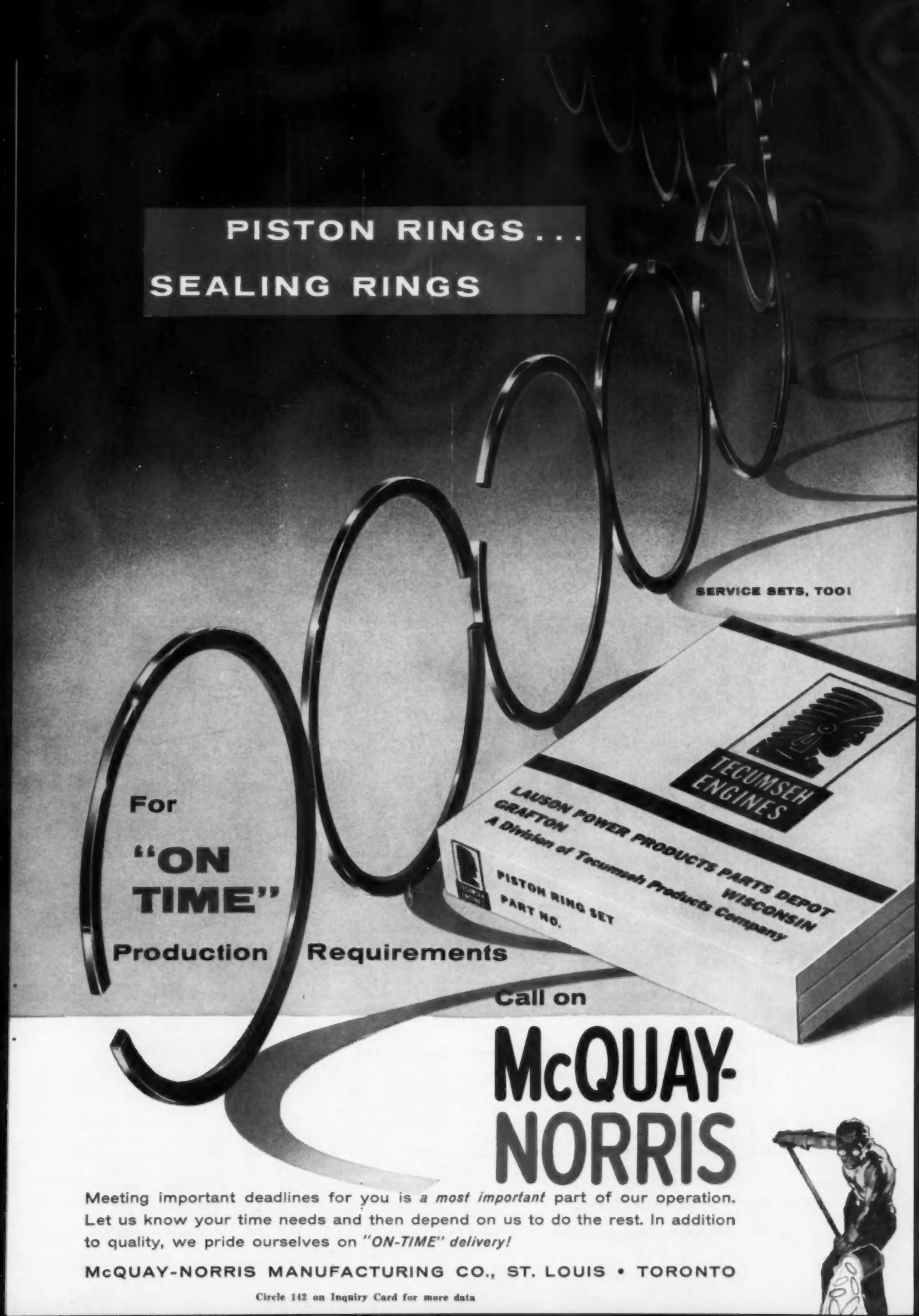
The Eaton Crankshaft-Driven Pump is an advanced version of the basic Eaton Roll-Pump design which has been performance-proven in operation on many leading passenger cars, motor trucks, and tractors. High efficiency, dependability, quiet operation, and low cost maintenance are tangible benefits inherent in this design.

If you are concerned with improving steering performance while cleaning up engine front end design and gaining additional under-hood space, call on us. Your inquiry will receive immediate attention.

EATON

EATON
PUMP DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

Circle 191 on Inquiry Card for more data


PISTON RINGS...
SEALING RINGS
SERVICE SETS, TOO!
TECUMSEH ENGINES
LAUSON POWER PRODUCTS PARTS DEPOT
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A Division of Tecumseh Products Company
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Meeting important deadlines for you is a most important part of our operation. Let us know your time needs and then depend on us to do the rest. In addition to quality, we pride ourselves on "ON-TIME" delivery!
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Circle 142 on Inquiry Card for more data

NEW PRODUCTS
AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

Press On Wheel

A polyurethane lug press-on wheel has been designed for material handling trucks. Made from Disogrin,

the wheel has been named Disowheel.

According to the manufacturer the new wheel has twice as many lugs as standard wheels of this type. The Disowheel is available in both solid and cushion types. The tires are reported to be resistant to chemicals and oils. *Disogrin Industries, Div. of Pellon Corp.*

Circle 70 on Inquiry Card for more data

New Type Alternator

A new type alternator with semiconductor voltage regulation is now available. It is designed for use on refrigeration trucks, taxicabs, police cars, fire engines, stationary power plants and similar applications requiring a heavy duty unit for auxiliary electrical equipment.

The alternator is available in two standard DC models, 15 volts DC, 1000 watts; and 100 volts DC, 1500 watts. Both outputs are rated at 1600 rpm.

Construction features include radially oriented ceramic permanent magnets in the toro. Thus, there are no brushes, commutators or slip rings. No separate electrical excitation is required. *Syncro Corp.*

Circle 71 on Inquiry Card for more data

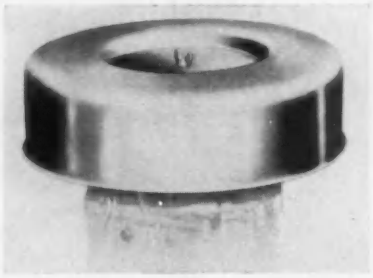
New Plate Steel

USS Fremax 45 is the designation given a new free machining plate steel. The new material has a relatively high tensile strength and yield point, with a carbon content of 0.40/-0.50. It was developed for special high strength, wear resistant applications and to provide good machinability.

In applications such as gears, sprockets, rings, cams, dies, wheels, rolls and machine ways where extra hardness and wear resistance is desirable, Fremax can be flame hardened. *United States Steel Corp.*

Circle 72 on Inquiry Card for more data

Air Filters



New air filter reported by the manufacturer to filter over 99 pct of impurities from air it filters. A feature of the unit is the chrome plated steel bonnet that encases the filter. Stelling and Helling Co.

Circle 73 on Inquiry Card for more data

Fume Control Equipment

An electrostatic "fume-burner" has been developed for use on all internal combustion engines. This device requires no chemicals, filters or lights and is applicable to cars, trucks, buses or stationary engines. According to the manufacturer, the fume control unit can be installed on an engine as easily as a muffler. *Morris Deoderizers.*

Circle 74 on Inquiry Card for more data

Lightweight Transmissions

Two new transmissions, for Diesel engines in the 190-250 hp range, have been introduced. The new units were designated the 5-H-74 and 5-HA-74.

One, the 5-H-74, is a five speed transmission of the general configuration of the popular 72 and 74 Series features a mainshaft of greater diameter, high capacity mainshaft pilot bearing. Low tooth pressures are assured by wide gear faces and all helical gearing, with jaw clutch engagement for short quick shifts.

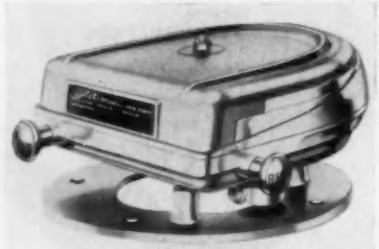
Use of aluminum case and clutch housing in Model 5-HA-74 results in saving of an additional 93 pounds of weight. *Fuller Transmission Div., Eaton Mfg. Co.*

Circle 75 on Inquiry Card for more data

Engine Self Starters

Self starters have been developed for application on gasoline engines up to 12 hp. A universal mounting feature has been provided to simplify installation. The mounting may be installed vertically or horizontally. Remote control cables may be attached to the starter if desired.

Movement of the start knob transfers full energy of the starter to the shaft of the engine to be started. The "Self-Energizing" feature of the starter can then be activated to use



the power of the engine to re-energize the starter. The starter can be energized manually in the event the engine fails to start. The unit is sealed in oil for longer life and is unaffected by extremes in temperatures. *Tiffany, Inc.*

Circle 76 on Inquiry Card for more data

Circle 143 on Inquiry Card for more data

New P/S Klozure Oil Seal*

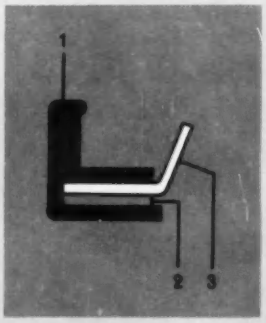
...Yet Costs No More! It's the seal of tomorrow for use today. Garlock P/S (Positive/Seal) KLOZURE Oil Seals with filled-Teflon** sealing elements offer the economical, built-in "permanence" demanded of modern design. They resist temperatures more extreme than ever encountered in normal operation; are chemically inert and unaffected by corrosion. They do not wear, nor score the shaft on which they are used; will seal at speeds to 3000 f.p.m. New Garlock P/S KLOZURE Oil Seals have been successfully tested on the GM Sealrater.

There's a lot more to the story of this fine new seal. Below are construction details; on the next page, you'll find application information. Send in the postcard and we'll send you an actual sample seal for examination. Garlock Inc., Palmyra, N.Y.

GARLOCK

Garlock P/S KLOZURE construction assures positive sealing:

1. **STEEL SHELL OR CASE** serves to enclose and position all component parts.
2. **SPECIAL GASKET** fitted tightly into position holds sealing element in place, provides extra leakage protection.
3. **FILLED-TEFLON SEALING ELEMENT** rides firmly against shaft, keeps oil in, dirt out.



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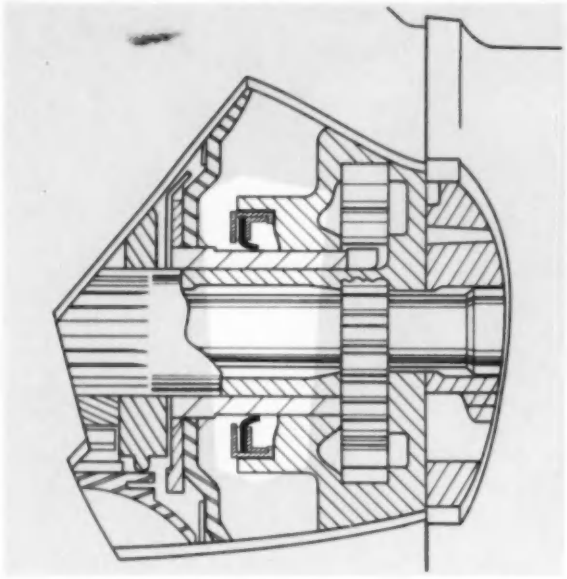
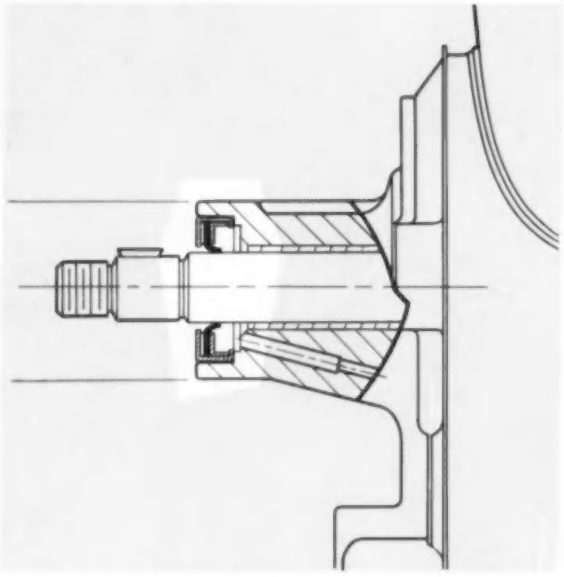
NEW P/S KLOZURE OIL SEALS



Cutaway shows general purpose seal in position. P/S KLOZURE Oil Seals outperform all others in standard 300-hour acceptance test.

FOR GENERAL PURPOSE APPLICATIONS . . .

. . . Garlock P/S KLOZURE Oil Seals outperform all others in a standard 300-hour acceptance test. Seals with synthetic rubber elements fail periodically, resulting in leakage. For example, nitrile rubber cracks and hardens; polyacrylate rubber loses its flexibility; silicone rubber swells and becomes soft. Garlock P/S KLOZURE Oil Seals emerge undamaged in tests run at 3600 r.p.m. speed on a $1\frac{7}{8}$″ shaft. Shaft-to-housing eccentricity is .010″ t.i.r.; seal-to-shaft eccentricity is .010″ t.i.r. P/S KLOZURE Oil Seals successfully resist Type "A" transmission oil at 300°F without harm or leakage.



Cutaway shows pump shaft seal in position. P/S KLOZURE Oil Seals outperform all others on standard 100-hour acceptance test.

FOR PUMP SHAFT SEALING UNDER PRESSURE . . .

. . . Garlock P/S KLOZURE Oil Seals are the ideal answer to the combined problem of speed, pressure, and temperature. Undergoing a standard 100-hour acceptance test, P/S KLOZURE Oil Seals outlast the synthetic nitrile, polyacrylate, and silicone rubbers that are in popular use today. Test conditions in this instance are an $\frac{11}{16}$″ shaft rotating at 6000 r.p.m. with an eccentricity of .003″ t.i.r. shaft-to-housing. Here again, Garlock P/S KLOZURE Oil Seals are unharmed against Type "A" transmission oil at a maximum of 275°F., pressure of 50 p.s.i. Of special interest to pump manufacturers is the universal suitability of this seal against all types of fluids, including non-flammable. No need now to match various sealing elements to various fluids—P/S KLOZURE Oil Seals handle them all!

SEE US AT GARLOCK BOOTH 618
AT THE DESIGN ENGINEERING SHOW

I would like more data concerning the new Garlock P/S KLOZURE Oil Seal that lasts four times longer than ordinary seals . . . yet costs no more! Please:

☐ Send sample seal ☐ Have sales engineer call

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Palmyra, N.Y. Twenty-six sales offices and warehouses throughout the U.S. and Canada.
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Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

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Out front, and ever-bright—looking its best when the weather is worst—Superior Stainless in the millions of windshield wiper assemblies on today's cars speaks for *enduring quality*. The stainless strip is made right to behave right—uniform as can be, from coil to coil. • There's a Superior grade to meet *your* application in every particular. Write.

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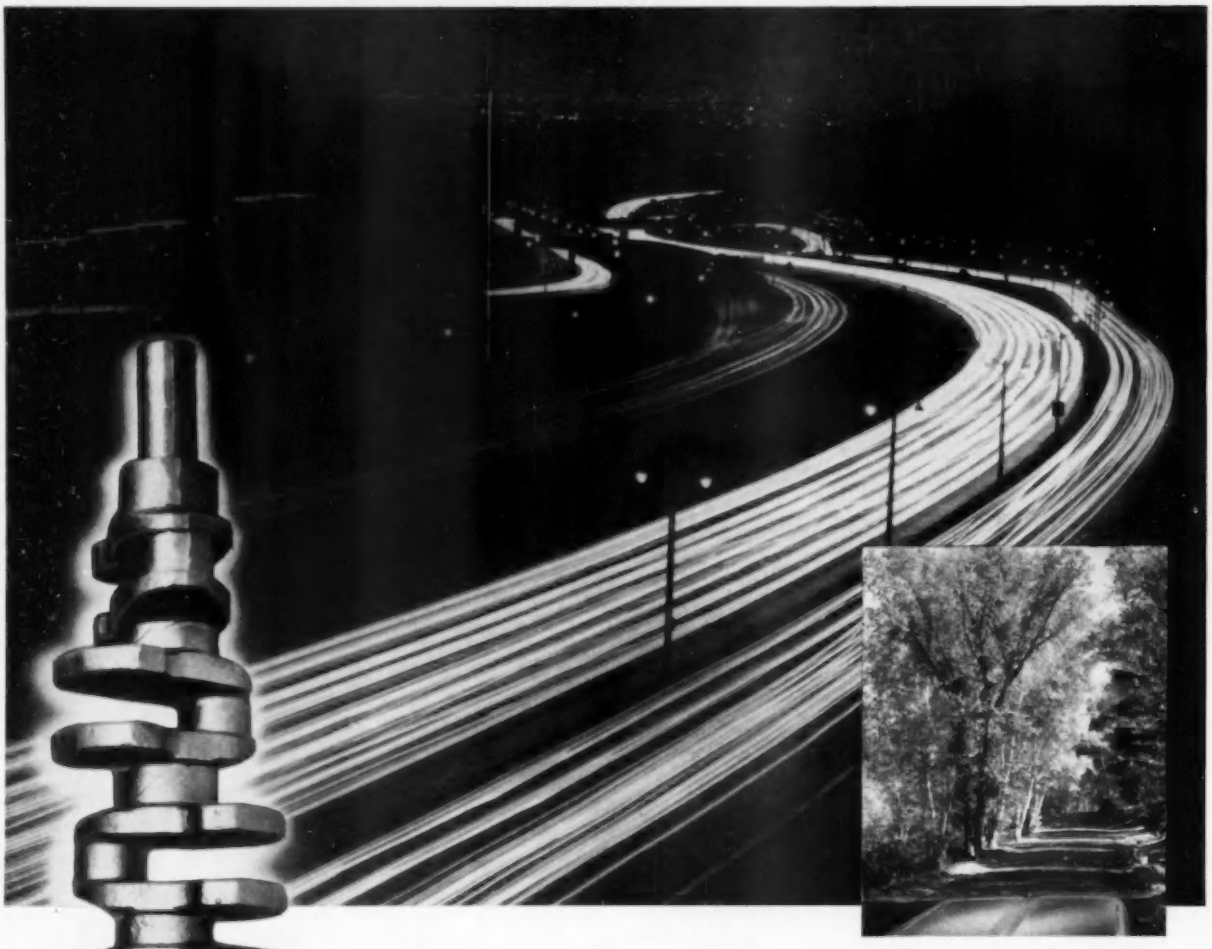

on teeming freeway . . . or scenic byway

Forgings insure trouble-free miles

It's always the forward-looking design decision . . . and production economy as well . . . to specify forgings for highly stressed parts. No other process duplicates the inherent strength and toughness or develops desired physical properties with the precision and uniformity of a forging. No other process provides this insurance of trouble-free miles. But to get these benefits in full measure the forging source is of equal importance to the process. Wyman-Gordon's long association with automotive applications can prove invaluable in translating your designs into forged parts of highest reliability.

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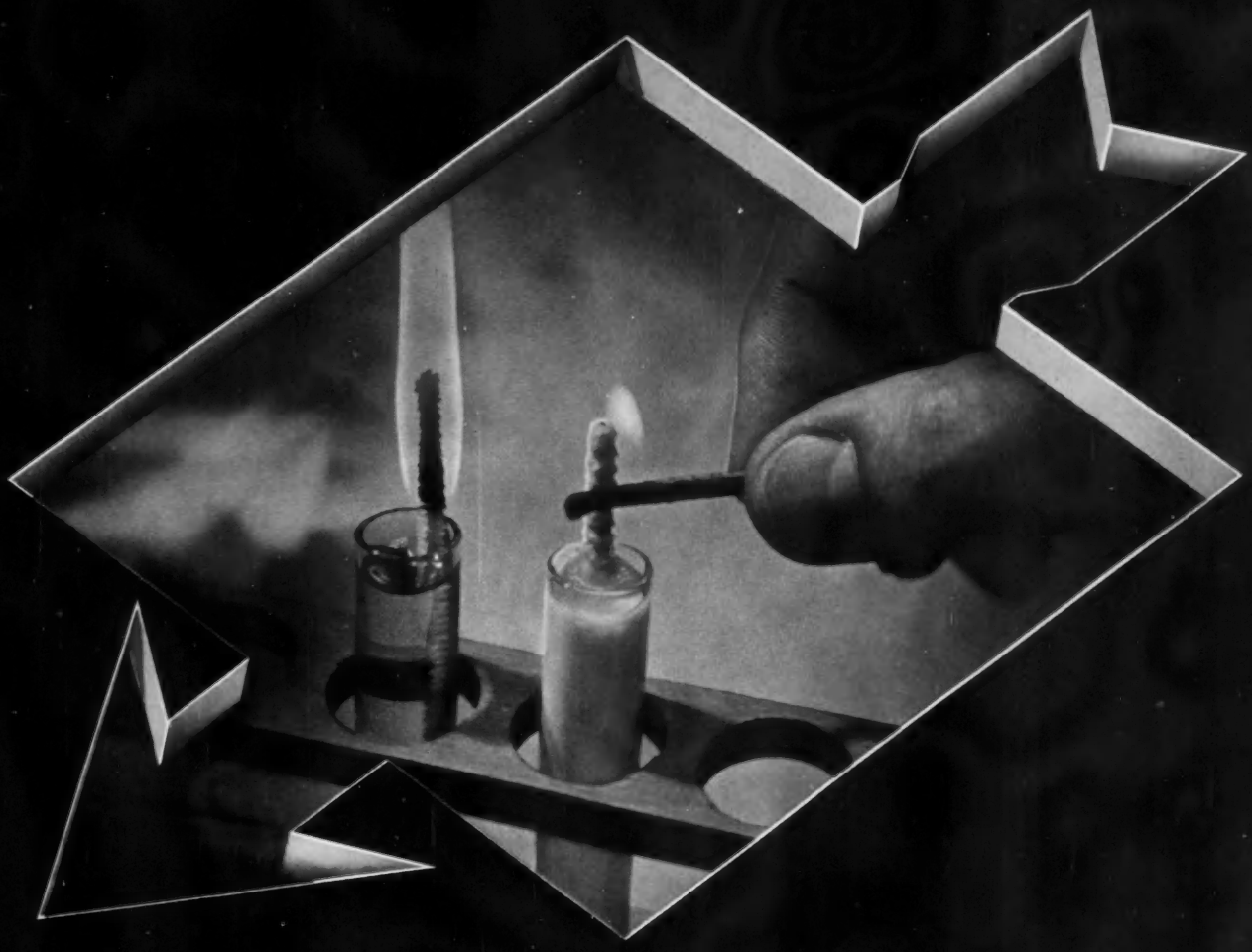
Circle 145 on Inquiry Card for more data

←Circle 144 on Inquiry Card for more data

Quality... the best economy of all



Another product of Sunoco research . . . a fire-resistant hydraulic fluid

The flame test, above, dramatizes the effectiveness of Sun's new fire-resistant hydraulic fluid. The wick in the conventional fluid burns readily; the wick in Sun's new fluid just can't be lighted.

SUNSAFE, a water-in-oil emulsion, eliminates fire hazards . . . provides increased safety to personnel and equipment. At the same time, operators get the essential performance characteristics of a top-grade hydraulic oil—low rates of wear, long service life, and protection against rust and corrosion.

This combination of *quality* in engineering know-how, and *quality* in product, proves once again that *quality* in any sense is the best economy of all.

For 73 years Sunoco has meant quality right down the line. Today, this quality is found in more than 400 Sunoco industrial products. SUN OIL COMPANY, Phila. 3, Pa., Dept. I-14. In Canada: Sun Oil Company Limited, Toronto and Montreal.

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO

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HOUGHTON HYDRAULIC FLUIDS

Important differences in fire-resistant fluids

Unlike petroleum oils, fire-resistant fluids have markedly different chemical properties which should be carefully considered before making a final selection.

To simplify this selection, we show here some of the variables—and limitations—of the three major fire-resistant types. Houghton is uniquely qualified for this unbiased analysis since we favor no one type over another. We make them all—and a full range of hydraulic packings as well.

1. Water-Glycol Fluids

These fluids contain water, glycol and a thickener. They provide the highest degree of fire protection. They are also compatible with the widest range of packing materials including those commonly used with petroleum oils. They should only be used, however, in systems operating at reservoir temperatures below 150°F.

Houghton's Houghto-Safe 200 and 600 Series are of this type and enjoy top acceptance and use by the armed services, as well as general industry. This wide-spread usage is due to important additives that provide *extra* anti-wear, rust inhibiting, anti-foam and metal deactivator properties to improve performance and increase pump life.

2. Phosphate-Ester Fluids

Fluids of this type are composed of straight phosphate esters and may contain small amounts of additives. These fluids can be used over the widest range of hydraulic pressures; they provide maximum lubricity for heavy bearing loads, and will stand up where ambient temperatures exceed 150°F. Packings used with these fluids must be Butyl, Butyl-Fabric or Polysulphide-impregnated Leather.

Houghton's Houghto-Safe 1000 Series are phosphate-ester fluids specially selected and compounded with additives to improve wear and rust resistance and add other proven operating benefits. Here again, Houghto-Safe 1000 Series has earned acceptance and is used on many military and space projects, as well as many of industry's toughest applications.

3. Emulsion Fluids

These fluids are either emulsions of water-in-oil (non-ionic) or oil-in-water (anionic). The following statements pertain to the water-in-oil type which are most widely used in industrial hydraulic systems.

Since these fluids are made of water and petroleum, they are compatible with standard Buna N rubber packings. They are also the lowest cost of all fire-resistant fluids. Their fire resistance is also the lowest of all three types; they should be used only in areas requiring a moderately safe fluid. The operating pressures of these fluids is generally limited to under 1000 psi.

Houghto-Safe 5000 Series designates Houghton's emulsion type fluid. It is a water-in-oil (non-ionic) fluid not affected by water hardness. Special additives are used to provide stability of the emulsion and to increase lubricity.

COMPARISON OF HYDRAULIC FLUIDS

Fluid Type	Viscosity Temperature Characteristics	Fire Resistance	Lubricity	Max. Fluid Temp. °F.	Relative Cost
Emulsion Fluids	Fair	Fair	Fair	See Note	1
Water-Glycol Fluids	Very Good	Excellent	Good	See Note	2
Phosphate-Ester Fluids	Poor	Good	Very Good	See Note	3

NOTE:—The Joint Industry Conference (JIC) Hydraulic Standards recommends the following where systems are operated continuously.

1. For water base fire-resistant fluids, the temperature of the fluid should be controlled so as not to exceed 120°F. at the pump inlet.

2. For other fluids, including petroleum oil, the temperature of the fluid should be controlled so as not to exceed 130°F. at the pump inlet.

For unusual system conditions where it is impossible to adhere to these reservoir temperature levels, the Houghton representative should be consulted.

For detailed information booklet describing all types of fire-resistant fluids, or help in selection, call your Houghton representative or write: E. F. Houghton & Co., 303 W. Lehigh Avenue, Philadelphia 33, Pa.

Houghton

INDUSTRY'S PARTNER IN PRODUCTION

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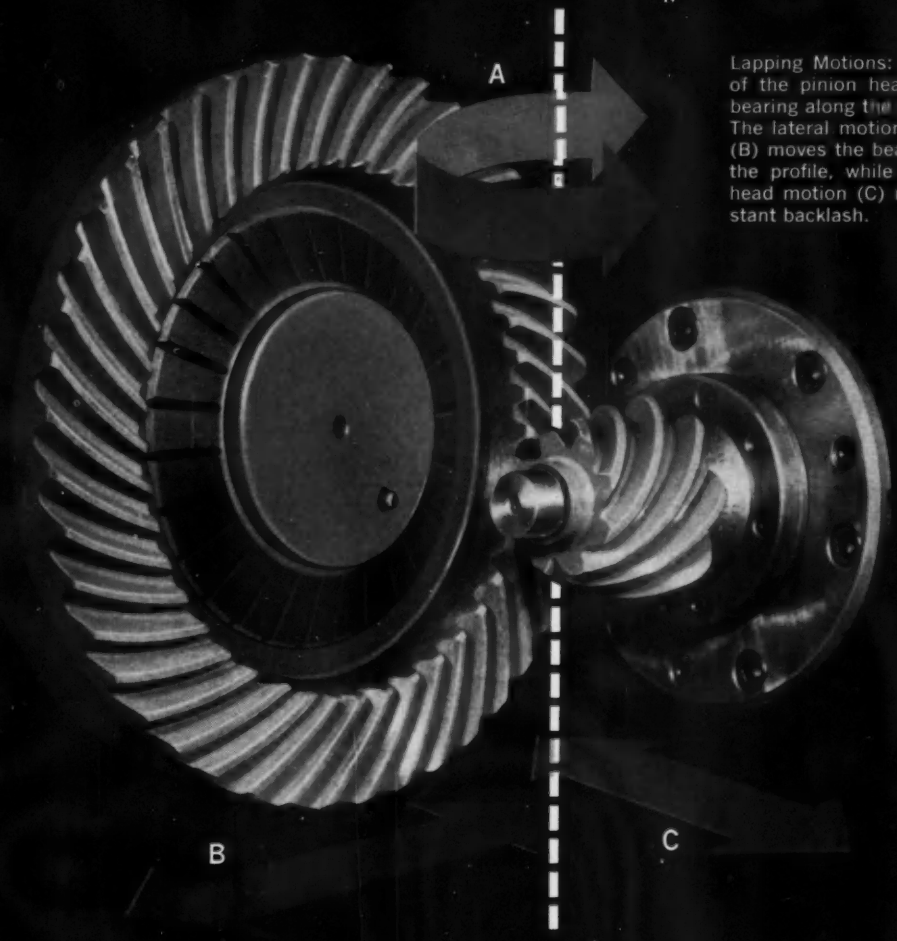


Lapping Motions: The swing motion of the pinion head (A) sweeps the bearing along the length of the tooth. The lateral motion of the gear head (B) moves the bearing up and down the profile, while the lateral pinion head motion (C) maintains the constant backlash.

New "Swing Pinion Cone" motions lap gears to 26" diameter automatically

Several design innovations in the new Gleason No. 504 Lapper combine to offer you a *more flexible* machine, *more accurate* results; a machine that will give you *more consistent* gear sets.

The new *SPC** motions allow a more rigid design—and the gear tooth surface responds more quickly and more consistently than to the previous types of lapping motions. Production rates are substantially increased.

The swinging motion of the pinion head sweeps the tooth bearing area along the length of the tooth, while horizontal motions of both heads move the bearing up and down the tooth profile, while maintaining uniform backlash.

Servo Controls provide for simpler setup and operation, and further contribute to increased speed and accuracy. All lapping motions are established by simple dial settings. This electrical control is positive and fast acting.

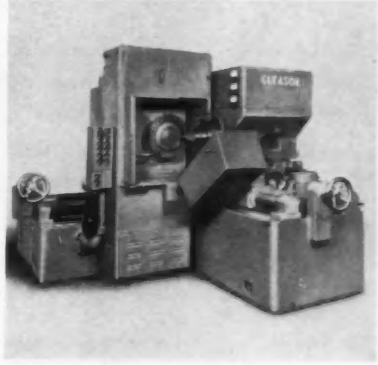
You can lap hardened spiral bevel and hypoid gears with 90° shaft angles, and conventional gears with shaft angles from 50° to 110°. Add an angle plate for the pinion head and you extend the work range from 10° to 160°.

An optional variable speed drive motor permits spindle lapping speeds from 200 to 2000 RPM.

No cams or special parts are required from job to job other than arbor equipment.

For more information and specs, write us. We'll be glad to send full details promptly.

*SPC means "Swing Pinion Cone."



No. 504 Hypoid Lapper

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

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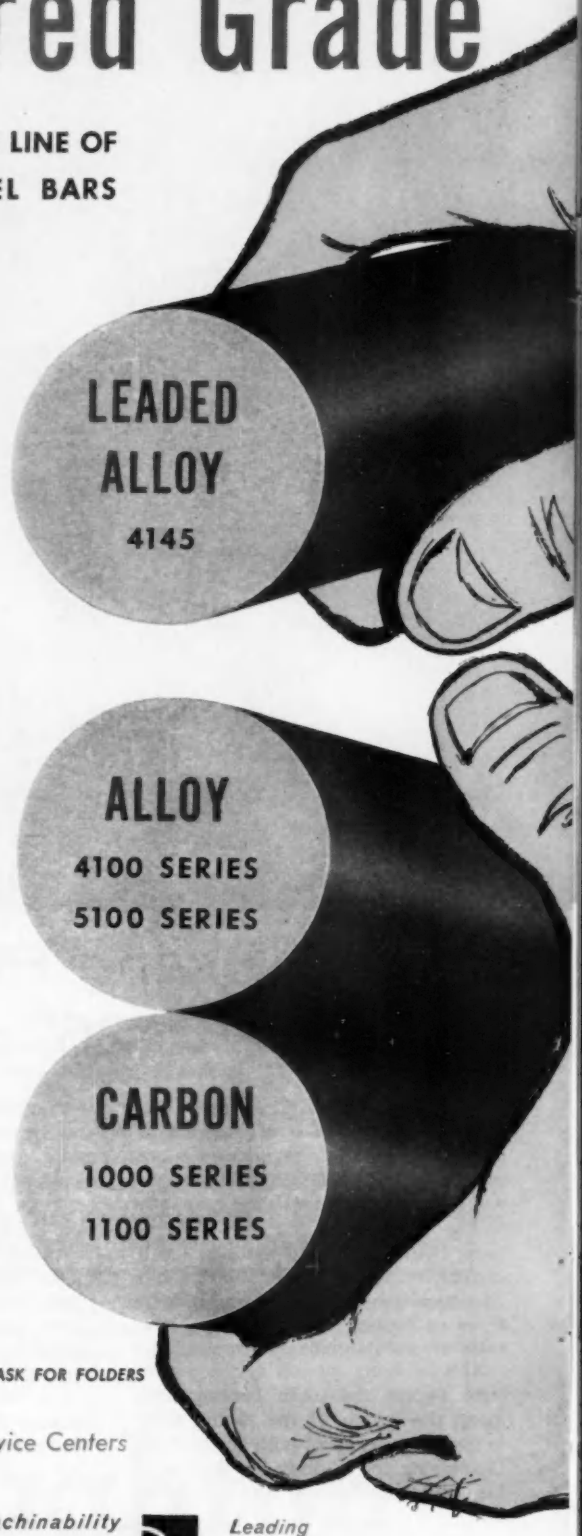
ANNOUNCING ANOTHER *NEW* COST-REDUCING

Strain-Tempered® Grade

NOW...THE INDUSTRY'S MOST COMPLETE LINE OF HIGH-STRENGTH COLD FINISHED STEEL BARS



NEW for maximum machinability

Strain-Tempered 4145 Leaded is the easiest-to-machine high-strength alloy bar you can buy. Heat treatment and related distortion corrections after machining are eliminated. Tool life is increased. Both material and processing costs are reduced. Strain-Tempered 4145 Leaded is another money-saving development of Bliss & Laughlin research.

Guaranteed Minimums: 150,000 psi tensile strength; 130,000 psi yield strength; 302 Brinell. Approximate minimums: 10% elongation in 2"; 35% reduction in area.

LOWEST COST for highest strength

Strain-Tempered alloys are also produced to other strength levels at savings from $29 to $87 per ton. Grades like 4140 and 5150, for example, can be produced to individual mechanical property specifications such as: 115,000, 125,000 or 145,000 psi minimum tensile strength; 95,000, 105,000 or 125,000 psi minimum yield strength; 217/255, 269/321 or 275/325 Brinell and 27/34 or 28/36 Rockwell "C". Various combinations of severe cold working and special furnace treatment tailor the material to your exact requirements.

PAY ONLY for the grade needed

As in the case of Strain-Tempered Alloy, Strain-Tempered Carbon Bars are available in a variety of grades. You pay only for the grade which meets your machinability needs. These bars offer a unique combination of high strength, long wearability, good ductility and a low level of residual stresses.

Guaranteed Minimum: 100,000 psi yield strength for standard Strain-Tempered C1144.

ASK FOR FOLDERS

NEW Strain-Tempered 4145 Leaded Now in Stock at Steel Service Centers

Specialists in Finish, Accuracy, Straightness, Strength and Machinability

BLISS & LAUGHLIN

GENERAL OFFICES: Harvey, Ill. • MILLS: Harvey, Detroit, Buffalo, Los Angeles, Seattle, Mansfield, Mass.

Leading Independent Producer of Cold Finished Steel Bars

BL-612

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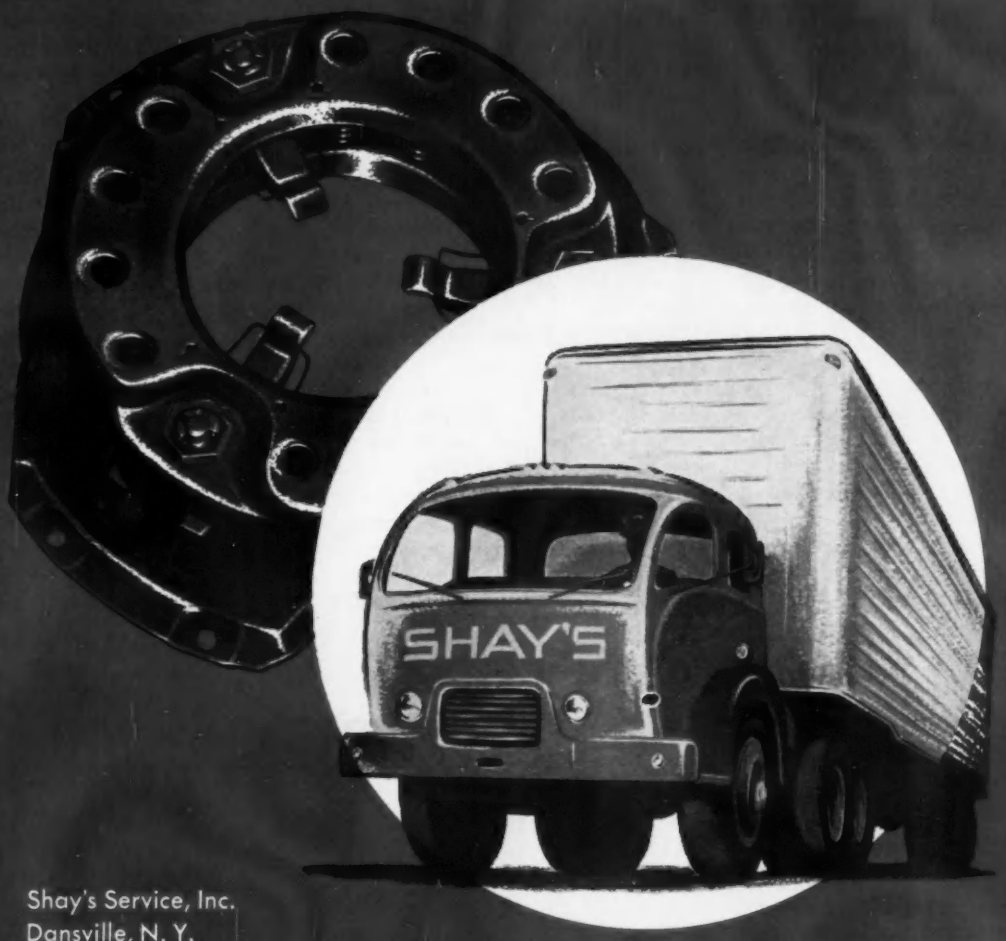
In the Lipe Spotlight...



Shay's Service, Inc.
Dansville, N. Y.

"LIPE CLUTCHES

cut our clutch maintenance problems to a minimum!"

"As an LTL Carrier working in a 75-mile area, our trucks make up to 50 delivery stops a day," declares Maintenance Supervisor Alton Isaman. "That makes clutches one of the most vulnerable spots in the power train.

"When we started replacing with Lipe, we cut our clutch maintenance problems to a minimum."

Mr. Isaman continues: "Whether we measure them by cost per ton-mile, number of disengagements, down-time or labor, the Lipes give distinctly superior service. What's more, *every* clutch in our 65-unit fleet . . . original and replacement . . . will shortly be changed over to Lipe."

Continuing experiences like these show how, with fleets everywhere . . . .

LIPE DELIVERS IN THE CLUTCH

© LIPE—ROLLWAY CORPORATION, SYRACUSE, NEW YORK

The Role of Inspection

in Quality-Control

By C. G. Bauer
Director of Quality Control
Chrysler Corp.

THE attitude of manufacturers toward quality-control has changed greatly over the years. We have progressed far beyond the primitive system of final inspection. In the old days, of course, there were departmental inspectors in most manufacturing businesses. But they were few, and they had inadequate testing equipment and reporting systems. Quality-control was largely a matter of the inspector at the end of the manufacturing process passing or rejecting the completed product. Well—rejects were expensive to a company in those days, as they are now. And knowing this, the final inspector was under strong pressure to pass any product that faintly resembled what it was supposed to be.

The automobile industry, too—in its infancy—relied on final inspectors who were sensitive to the cost of rejects. I wouldn't go so far as to say that the typical final inspector in an assembly plant passed every car that had all four wheels on it, but the quality in those days certainly couldn't match what it is today. Some of you are old enough to have cranked an arm off trying to start one of those early cars that had a defective ignition system or was out-of-time. And if you are that old, you may also have lost expensive equipment on bumpy roads or struggled inch-by-inch up a steep grade pampering a leaky radiator and a hot engine.

Back in those days in the automobile business, an eager-beaver would occasionally get the job of final inspector and fill the plant-yard with cars that had defects of one kind or another. When that happened, the plant manager was apt to do two things, first, fire the inspector and second, ship the cars —defects an all—before he himself got fired.

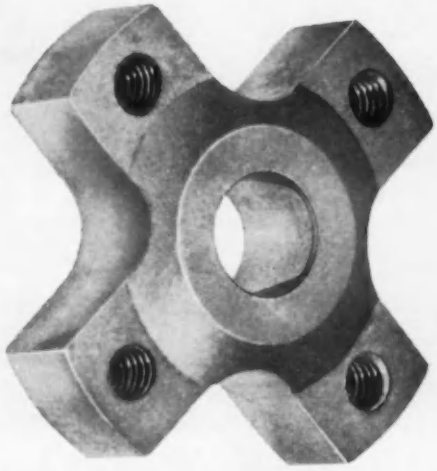
The quality-control system that relied heavily on final inspection couldn't endure. American manufacturers learned techniques of mass production that could fill the needs of millions of people. And these millions soon began demanding not just more products, but better products. At the same time, research and development teams throughout industry were providing manufacturers with the means of building better products. They discovered new, more sophisticated materials. They explored the possibilities of new designs. And they came up with inventions and innovations, many of which were revolutionary. (*cont'd, page* 106)

THE AMPLEXOLOGIST

puts a customer in clover

This engine fan-pulley hub was formerly a solid circular casting. The manufacturer had to machine the face, bore the ID, drill and tap four holes. The Amplexologist designed the present cloverleaf shape to reduce weight and material cost. Now produced by powder metallurgy, the hub requires no machining—except tapping the holes. Total savings 33%. Sound interesting? Call the Amplexologist.

AMPLEX
DIVISION
CHRYSLER
CORPORATION
DETROIT 31, MICHIGAN
OILITE



SEND FOR THE SECRET OF THE AMPLEXOLOGIST'S SUCCESS

1 ENGINEERING MANUAL
45 pages of technical information: How to determine correct applications for powder metal parts, bearings, filters.

2 NEW BEARING STOCK LIST
20 pages. 1066 standard sizes of Oilite self-lubricating bearings—bearing material. Selection guide, engineering data.

The millionth set of AUSCO brakes

PROVES ADAPTABILITY, TOP PERFORMANCE, USER SATISFACTION

We don't know exactly where the millionth set of Ausco disc brakes is at this moment. However, our records show that since 1939 we have shipped well over a million sets for original equipment installation on farm tractors, self-propelled farm implements and other types of heavy machinery. Manufacturers specifying Ausco disc brakes include nearly all the leaders in the field.

In addition, Ausco has supplied thousands of disc clutches to implement and equipment manufacturers.

You will agree that continuous volume acceptance like this is a powerful endorsement for the way Ausco disc brakes and clutches are designed and manufactured and for the way they perform. It will pay you to find out how they can be applied to your equipment.

AUSCO
DISC BRAKE
for tractors, self-propelled farm implements,
road building, industrial and construction machinery...
AUSCO
DISC CLUTCH
for power control applications
on farm tractors and other heavy machinery...
Manufactured by AUTO SPECIALTIES MANUFACTURING CO., St. Joseph, Michigan

Write

for your copies of the new brochures describing Ausco disc brakes and clutches in detail—

AUTO SPECIALTIES MANUFACTURING CO.
St. Joseph, Michigan

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(*Continued from page* 104)

Competition—the greatest single blessing of our free economy—did the rest. To stay in business—to share in the dynamic industrial growth that characterized the first half of this century—manufacturers had to build these improvements into their products. And they had to find effective and economical ways to do it. The development of formal quality-control programs was inevitable.

There wasn't much to work with in the beginning. For example, water-test booths—instead of being carefully engineered as they are now—had nozzles pointed in all directions spraying water at a dozen different pressures. Needless to say, when it came to evaluating water-tightness, you got a dozen different shades of opinion. Welding-testing equipment consisted of a pry-bar and a strong right arm. And the torque wrench was used only on cylinder-head bolts.

I remember one of my earliest experiences with quality-control—although it wasn't even called quality-control in those days. I was works-manager at the old Kercheval Body Plant. One fall, the inspectors began reporting that foreign matter was somehow getting into our paint. The pattern was irregular, but it persisted. Too many cars had to be refinished. And by Christmas, the plant manager was almost out of his mind.

I knew how desperate he was from the action he took. He pulled me off a job I knew very well and put me—at full time and with complete authority — on a job I didn't know at all.

I learned as I went along by accumulating inspection data. I began by checking the paint jobs by color, and I found that bad finish was turning up in all colors. I next had the mixing-room men strain all the paint through cheesecloth. Still no results. Then, I began checking the metal surfaces on the body-in-white before it came into the paint shop. These surfaces were carrying some dirt, so I had the metal-washing units cleaned oftener. The number of bad paint-finishes dropped off, but some kept coming through.

I checked the plant ventilating system, but it was working efficiently. I then began to wonder about the dirt particles that came into the plant on materials and on the shoes of employees. As it turned out, this dirt was a factor. The atmospheric pressure inside the plant varied, depending on the direction and velocity of the wind blowing outside the plant. And each change of atmospheric pressure inside the plant created just enough turbulence to pick up the dirt particles and carry them to the paint shop. Equalization of the atmospheric pressure in the plant again cut the number of bad paint-finishes. But, again, some kept coming through.

As I went ahead, I was able to find and eliminate the conditions that were causing poor paint-finishes. I remember that toward the end of my investigations, bad paint jobs in significant numbers were showing up only on Mondays and

(*Turn to page* 112, *please*)

Tougher... Lighter... Smaller

handles more air with minimum pressure drop

HANSEN SERIES RL QUICK-CONNECTIVE RING LOCK COUPLING

Handles any job in your shop using 3/4" to 1/8" connections — from the air line to the air tool — eliminates any need for various size couplings in hook-up — makes it easy to keep stock of parts in balance — holds inventories to a minimum.

All Series 2-RL Sockets and Plugs are completely interchangeable — likewise all larger Series 3-RL Sockets and Plugs.

Has fewer parts. Locking ring provides positive lock...tight fit...minimum wear. Equipped with automatic sleeve lock.

REPRESENTATIVES IN PRINCIPAL CITIES ... SEE YELLOW PAGES

Instant Automatic Flow or Shut-Off

Quick-Connective Fluid Line Couplings for... COMPRESSED AIR HYDRAULIC FLUIDS • OIL • GREASE • WATER VACUUM • STEAM • OXYGEN • ACETYLENE REFRIGERANTS • GASOLINE • COOLANTS • LP-GAS

Write for the Hansen Catalog

Here is an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes and types of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings.

SINCE 1915 QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

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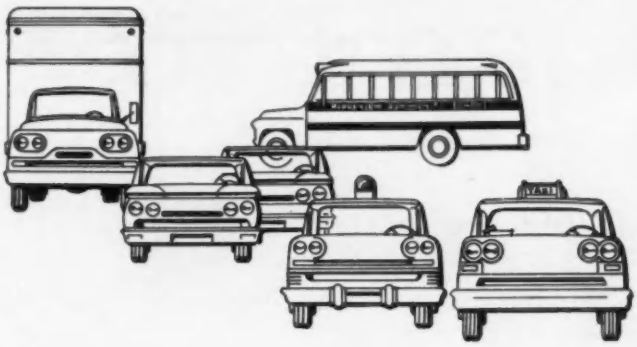
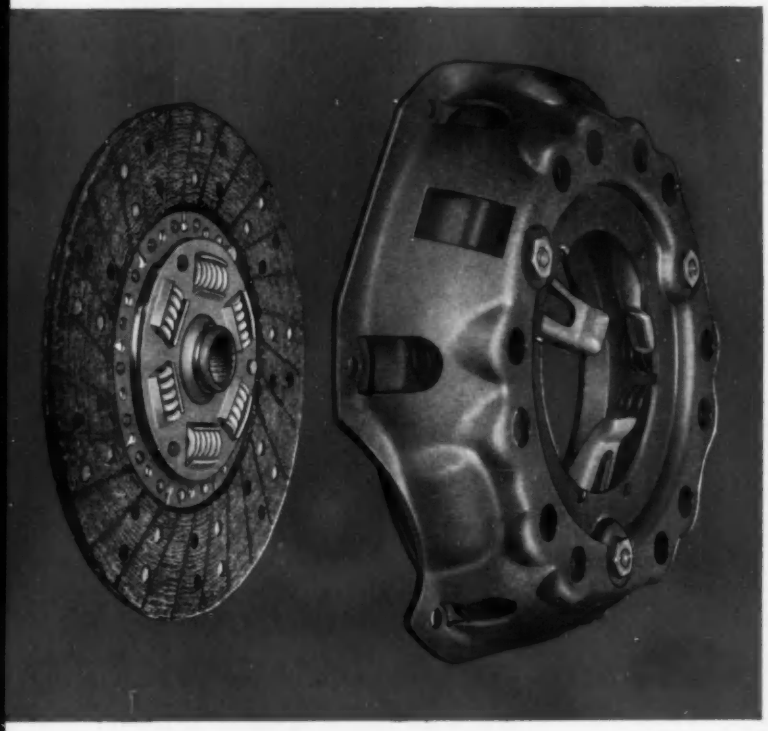


New Interchangeable BORG & BECK Clutches for Fleets, Police Cars, Taxis

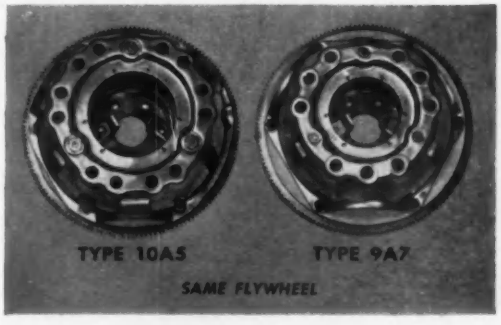


More Capacity—no increase in bolt circle or flywheel size

Now there's no need to change the bell housing, flywheel, motor mounts or pedal linkage when converting cars for fleet, police, taxicab or other heavy duty service. Borg & Beck's new A5 clutches are designed specifically for these installations, as well as for trucks and school buses—provide the additional capacity required, yet are interchangeable with the next smaller size of Borg & Beck Types A7, A8 or A9 clutches.

Type 10A5, for example, mounts on the same flywheel bolt circle as Type 9A7—yet is rated at 265 ft.-lbs. torque capacity compared with 210 ft.-lbs. for the 9A7.

Like all Borg & Beck clutches, the new Type A5 clutches are designed, engineered and built to Borg & Beck's leadership standards for quality, performance and value. That's your assurance of complete satisfaction. Consult our engineers for full details.



BORG & BECK CLUTCH THE STANDARD
Reg. U.S. Pat. Off.

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B-W
DIVISION
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BORG & BECK

THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

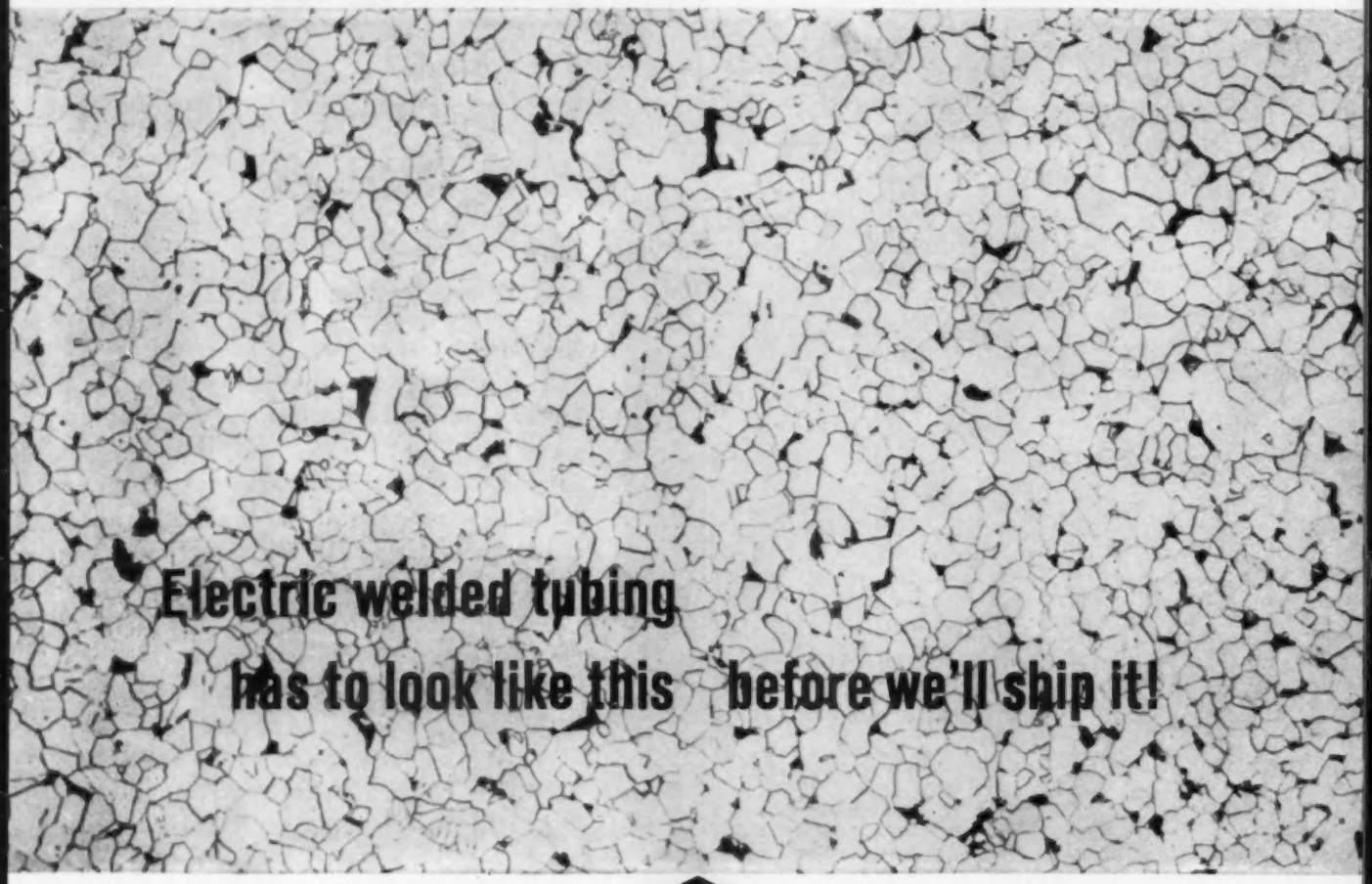
BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

Export Sales: Borg-Warner International, 36 S. Wabash, Chicago 3

This mark tells you a product is made of modern, dependable Steel.

Portrait of a perfect weld

Magnification—100X; Etch-Picral Nital



In this photomicrograph of a section of USS National Electric Resistance Welded Steel Mechanical Tubing the weld section runs right down through the center of the picture above the arrow. The consistency of structure between the weld area and the rest of the tube shows that USS National Welded Mechanical Tubing has an important attribute—dependability.

Mechanical tubing must be flawless. It's used in so many critical applications that demand utmost strength, excellent surface inside or outside and extreme dimensional accuracy. National Tube's production methods assure this high quality.

Important advantages of USS National Welded Mechanical Tubing are its ability to reduce machining operations to a minimum or eliminate them entirely. For a given weight, it withstands more load than any other section. It resists bending stresses equally in all directions. In torsion, it provides maximum material distribution.

USS National Welded Mechanical Tubing is available in cold-drawn or hot-rolled sizes ⅜″ thru 5½″ and in wall thickness .035″ to .250″. All sizes can be obtained from National Tube Distributors located throughout the country. They will gladly show how tubing can reduce your costs. *See your USS National Tube Distributor.* *USS and National are registered trademarks*

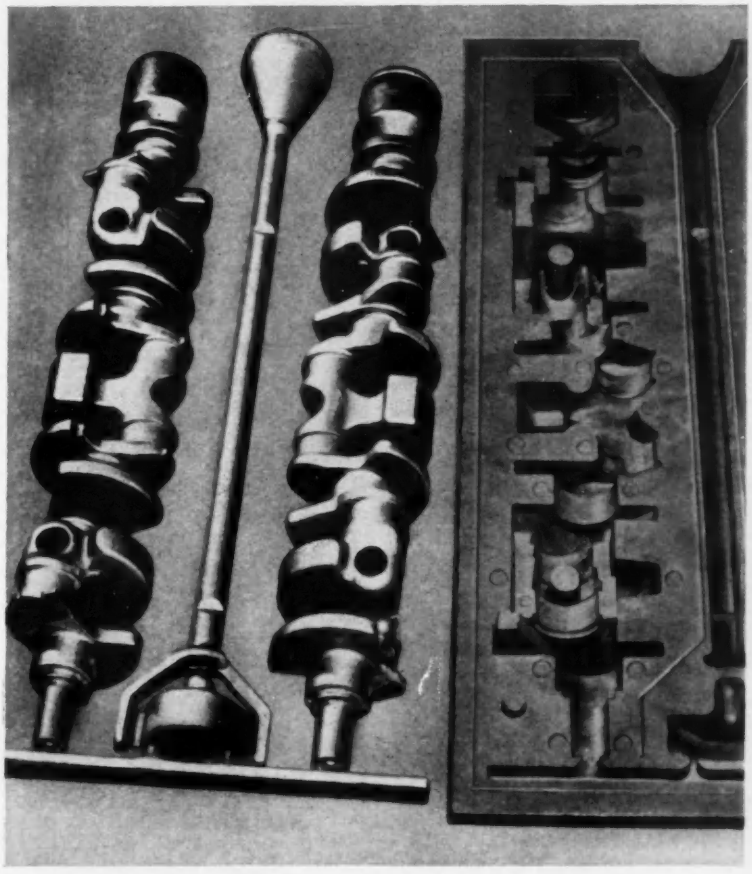
National Tube Division of United States Steel

USS

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • United States Steel Supply Division • United States Steel Export Company, New York

SILICONE NEWS from Dow Corning

For Fast Get-away



Silicones Speed Production of Crankshafts for Ford Falcons

"Fast get-away" is an appropriate description for the way foundry shell molds pop free from patterns coated with Dow Corning silicone parting agents. Quick, clean and easy release every time helps assure uninterrupted production, retention of close tolerances, less machining. Here's proof from the Ford Motor Company foundry.

In one production operation, shell molds for casting crankshafts are made on a high production, multi-station rotating machine. Failure of just one shell to separate from its pattern would quickly bring operations to a halt . . . result in waste, rejects and mounting labor and material costs. But not at Ford. Their foundry engineers prescribed the right preventive medicine years ago when they settled on an emulsion of silicone as a shell mold parting agent. All it takes for good results is a light spray coating of the dilute emulsion.

In another shell mold operation Ford dips multi-unit engine valve patterns in the dilute emulsion. Even with such deep draws as are encountered with small diameter valve stems, release is clean and easy . . . production stays on schedule.

If lack of "fast get-away" is hampering your production, why not put Dow Corning Silicones on the job? Send today for a free manual detailing "how to use silicone parting agents in shell molding."

Address Dept. 1318

For complete technical information about any silicone product, contact the Dow Corning office nearest you.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

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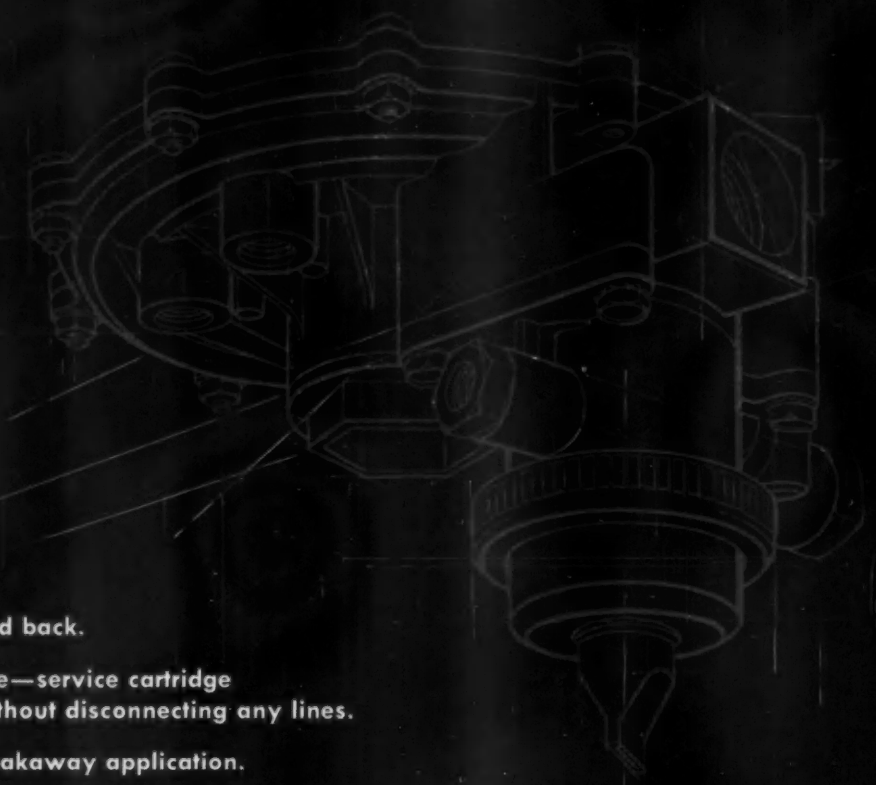
Dependable Midland Relay Emergency Valve

TOUGH-BUILT FOR TRUCK SERVICE



- Eliminates feed back.
- Easy to service—service cartridge removable without disconnecting any lines.
- Automatic breakaway application.
- Valve's dual compensating feature provides automatic, gradual application of trailer brakes if pressure in the system drops below 45 psi.
- Designed for fastest possible application and release time.
- Valve safeguards against vehicle driveaway without sufficient air in system.
- All parts treated to resist corrosion.

MIDLAND

MIDLAND-ROSS CORPORATION

Owosso, Michigan

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Still rates over 9 after 48 hours CASS testing
Still rates 10 after 8 cycles Corrodkote Testing
Still rates perfect 10 after 12 months outdoor exposure

All 3 severe corrosion tests show thicker chromium looks best longer

Under the ASTM corrosion rating system, plated parts start with a perfect 10. The hours of CASS* testing they survive or the cycles of Corrodkote† they endure while maintaining such a rating are an accelerated but reliable gauge of performance in service.

Results of such tests made on parts with thicker chromium plated from M&T processes showed that about 50 millionths of an inch of chromium dramatically increased durability, in some cases by as much as 500%. The improvement in corrosion resistance has now been corroborated by outdoor tests.

No matter which test you use—CASS, Corrodkote, or outdoor exposure—the pattern of protection is consistent. Thicker chromium over a proper nickel undercoat is best for durability.

And best for plating thicker chromium are M&T's SRHS® Baths. They enable you to plate a single or duplex deposit of MICRO-CRACK CHROMIUM in the thickness you want. Unlike thick ordinary chromium which *invites* corrosion through gross cracks, M&T MICRO-CRACK CHROMIUM *resists* the onset of rust and pitting. The duplex deposit proves best where ordinarily you might have trouble getting chromium coverage in recesses.

With SRHS Chromium Baths, you gain higher plating speed for more thickness in a given plating time. Benefit, too, from self-regulation of bath ingredients which assures better results, fewer rejects.

Ask an M&T plating engineer to explain all the advantages, survey your needs for current and 1962 models, and give his recommendations.

*CASS test: copper-accelerated acetic acid salt spray. †Corrodkote test: a standard, uniform, highly corrosive slurry is applied on test piece, which is then placed in non-condensing humidity cabinet. Each cycle is 16 hours.

M&T

plating products · welding products
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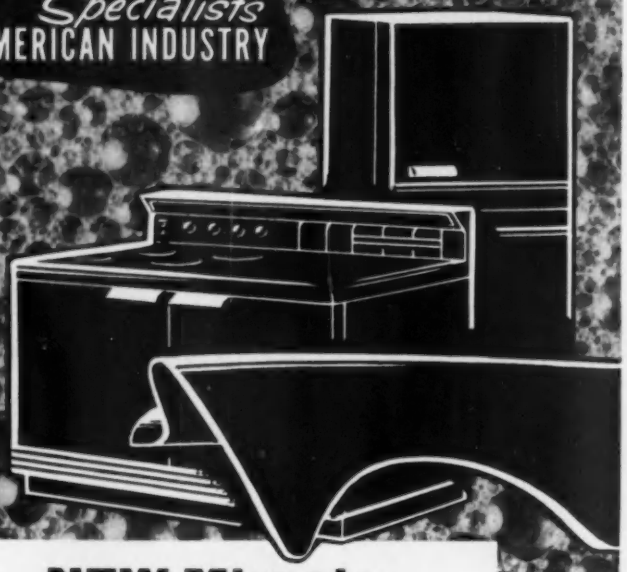
CLEANING *Specialists* FOR AMERICAN INDUSTRY



NEW Miracle Phosphate Coating MICROBOND

MICROBOND, a new product developed in the laboratories of Detrex Chemical Industries, Inc., is a micro-crystalline phosphate coating designed to greatly improve paint adhesion.

One of its many advantages in the pre-paint treatment of steel is its ultra-fine grained crystalline structure. It is a single material that requires no separate replenisher or accelerator and, in addition, has a very low sludge rate.

MICROBOND provides controlled optimum coating weights which allow one coat paint systems to produce a high gloss paint finish. This finish has far superior direct and reverse impact properties over conventional pre-treated finishes. It will operate in regular five or more stage equipment.

DETREX CHEMICAL INDUSTRIES, INC.
BOX 501, Dept. AI-661 • DETROIT 32, MICH.

Write today for detailed information on our products or services.

Perm-A-Clor® NA (trichlorethylene)
Solvent Degreasers
Ultrasonic Equipment
Aluminum Treating Compounds
Alkali and Emulsion Cleaners
Rust-Proofing Materials
Vapor Generators
Phosphate Coating Compounds
Paintbond Compounds
Extrusion and Drawing Compounds
Spray Booth Compounds
Industrial Washers

The Role of Inspection

(*Continued from page* 106)

Wednesdays. It didn't take long to establish that these were the two days when the painters changed into clean cover-alls. The freshly-laundered cover-alls were releasing lint that settled on the paint. When we began spraying our spray-men, our problem was licked.

My experience with paint-finish is a fair example of the old cut-and-try approach to quality-control —an approach, incidentally, that is still useful now and then when a brand-new problem crops up.

In the old days, there were very few precedents, only the beginings of system, and almost no publication of quality-control information. Nowadays, we do have precedent, system, and publication. Manufacturers—in their general attack on quality-control problems — are spending millions of dollars on precision testing and checking equipment and on highly trained personnel to operate it, observe results, and keep records for analysis and guidance. They regard quality-control as an exact science to be applied at every level of their operations.

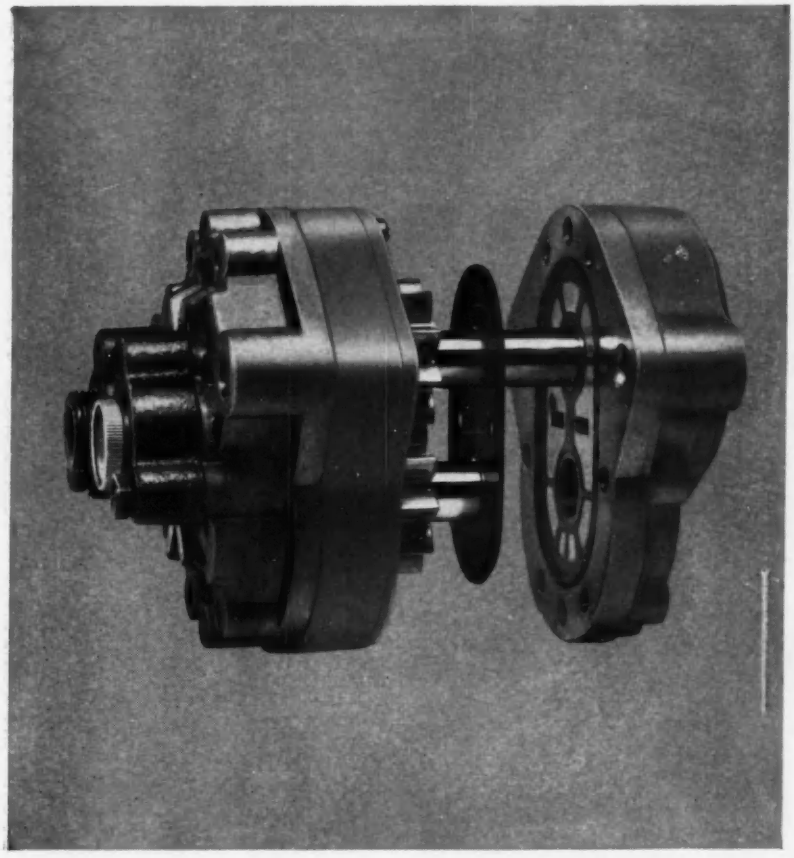
Every man on every level of a quality-control organization has an important job to do. But there are few jobs more important than that of the inspector—the man with his hand on the product. Most of us would agree that this statement is true. But we do not always act as though it is true. For example, take our quality-control publications. When we read them, we find plenty of statistical studies, analyses, and articles on how to make better "schimayzles" and "blibbiters." But most of the time we look in vain for solid informative material on inspection.

The national officers of our Society are mindful of the general failure to emphasize the importance of inspection. A few months ago, they activated a committee to study off-shoot quality-control organizations which might properly be brought into our Society both to their own advantage and ours. In activating the committee, our officers pointed out that we must

(*Turn to page* 116, *please*)

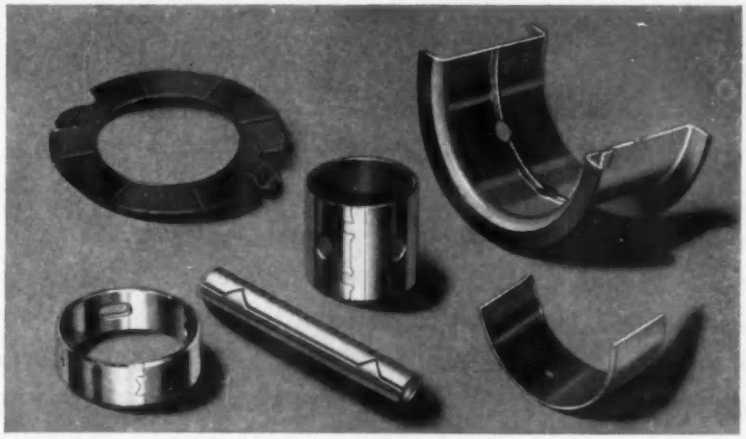
Circle 158 on Inquiry Card for more data

F-M WEAR PLATE "RIDES HERD" ON TURBULENT PRESSURE



IN CESSNA'S NEW HYDRAULIC PUMP LINE, F-M WEAR PLATE DIAPHRAGMS KEEP FLUIDS IN LINE to deliver pressures up to 2000 psi for aircraft, farm and construction equipment, many other hydraulic applications. These wear plate diaphragms maintain positive contact with gears to assure high, uniform pressure. To provide a bearing surface for this job, Federal-Mogul applies a high-density bronze to steel by a special sintering process. F-M high-density bronze prevents fluid absorption, and it affords good lubricity, needed because some hydraulic fluids are poor lubricants. To further prevent the escape of hydraulic fluid, these F-M diaphragms are manufactured for a snug, close-tolerance fit in the pump housing.

THE COMPLETE LINE of products from Federal-Mogul Division includes sleeve bearings, bushings, spacers, thrust washers, as well as wear plates. Through the years, F-M has amassed a wealth of knowledge and experience . . . from constant research, from solving bearing design problems for all kinds of products. Our engineers are ready to put this know-how to work and tailor bearing products to your requirements . . . with top performance assured.



A DESIGN GUIDE provides valuable engineering data for designers on F-M thrust washers as well as wear plates. Also available is literature on sleeve bearings, bushings and spacers. For your copies, write Federal-Mogul Division, Federal-Mogul-Bower Bearings, Inc., 11037 Shoemaker, Detroit 13, Michigan.

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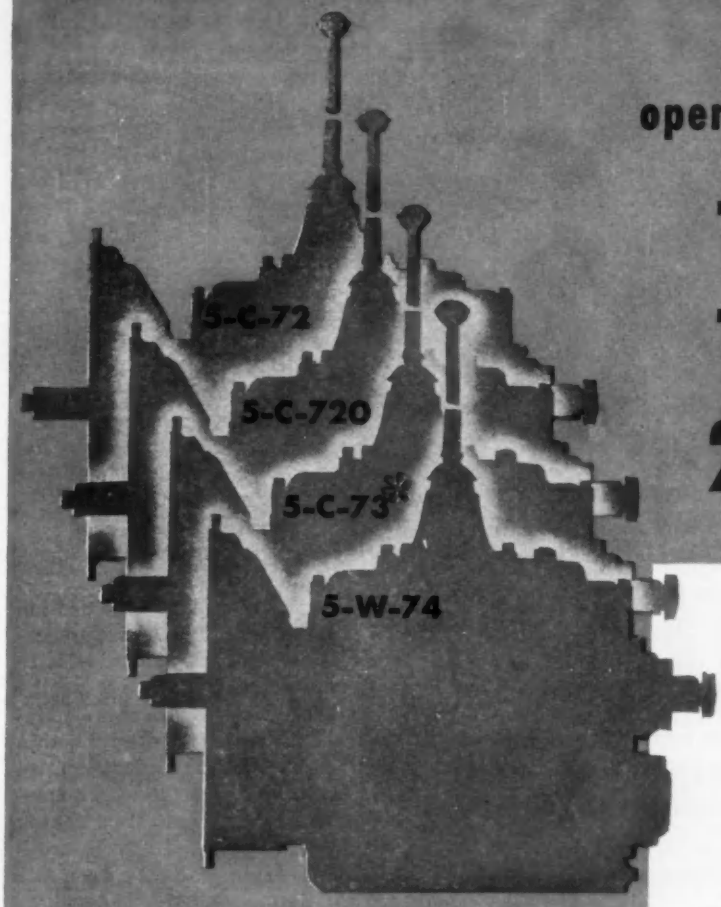
VERSATILE, DEPENDABLE FULLER 5-Speeds



provide maximum operational flexibility

10 speeds with 2-speed axle or 2-speed auxiliary

15 speeds with 3-speed tandem axle or 3-speed auxiliary

20 speeds with 4-speed auxiliary

Lightweight options with aluminum housings:

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93 pounds lighter

* designed specifically for use with Eaton 3-speed tandem axles.

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Undercoat of Oakite CRYSCOAT adds to the looks and life of finishes

From toys to tractors, painted metal products look better and last longer with Oakite CrysCoat under the paint.

CrysCoating—the conversion of a steel surface to a phosphate surface—creates a perfect base for paint adhesion. Paint goes on in a smooth, serviceable coat. Once on, it stays on.

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over 50 *Est. 1909* SCIENCE

years' leadership in industrial cleaning

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The Role of Inspection

(*Continued from page* 112)

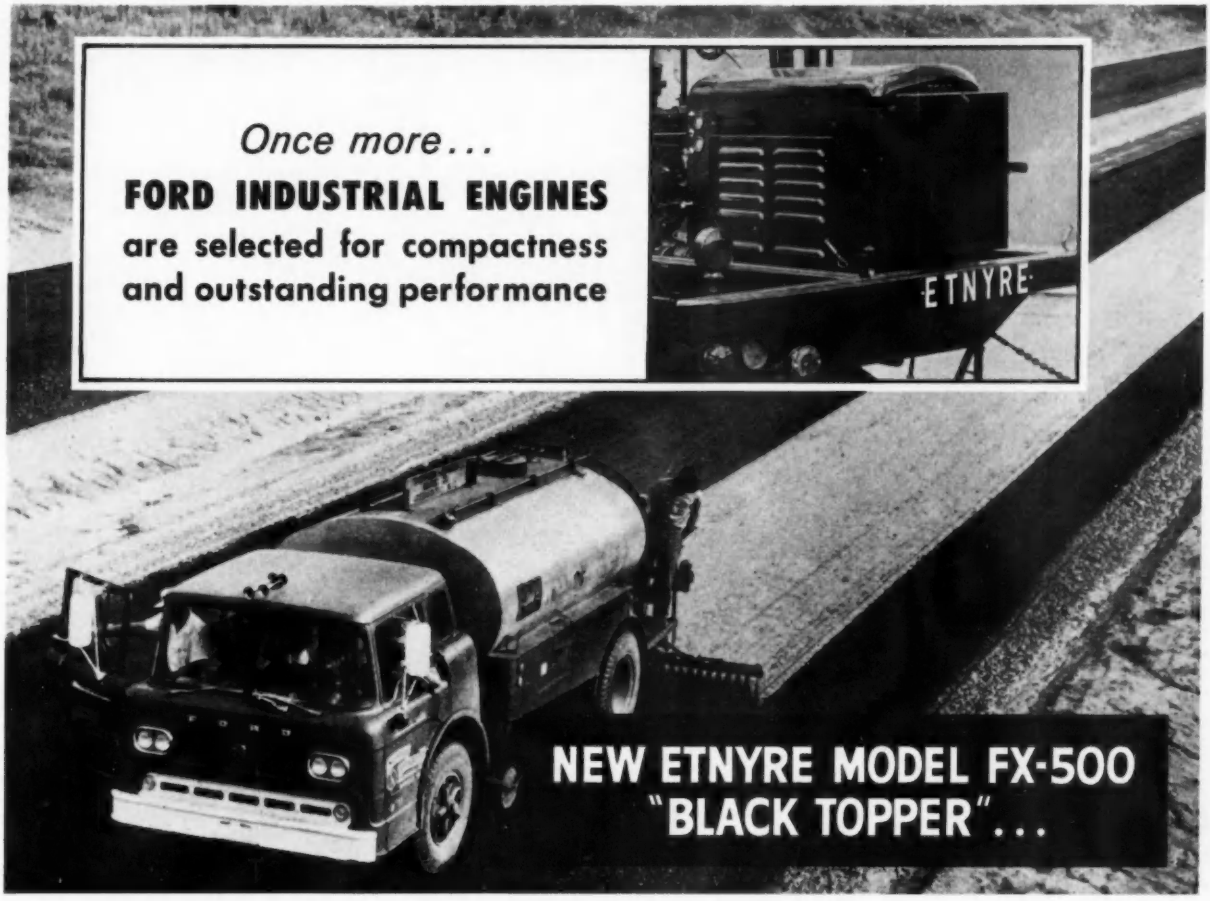
do all in our power to assure these independent organizations that their special fields of interest will not be neglected. Singling out those organizations primarily interested in inspection, our officers pointed out that such assurance might well take the form of more inspection articles in our publications and more inspection meetings at the sectional level.

While in the past we have sometimes failed to emphasize the importance of the inspector, we don't question his importance. We know that in both of his main functions, the inspector is absolutely essential. In the one function, he catches and eliminates customer-irritating flaws and helps increase company strength in the market, where every company must have strength. In the other—in his reporting function—he feeds raw data up through the quality-control organization. Without such information, the quality-control structure would collapse—and the entire manufacturing process wouldn't be far behind.

The quality-control organization is to the manufacturing process what the feed-back apparatus is to automated equipment. Just as the feed-back keeps a piece of equipment functioning properly within set limits—so the quality-control organization keeps the entire manufacturing process functioning properly within set limits. In order to do this—in order to keep the green light burning—the quality-control organization depends heavily on its own feed-back—inspection.

My point is clear. Without inspection, there is no quality-control at all. And without accurate inspection, there is only loose and costly quality-control. On the other hand, to the extent that inspection provides accurate and fast feed-back, then to that extent inspection strengthens the quality-control structure and the entire manufacturing process. It is no exaggeration to say that analysis of the information contained in inspection records dictates the proper action to be taken by all other company

(*Turn to page* 123, *please*)



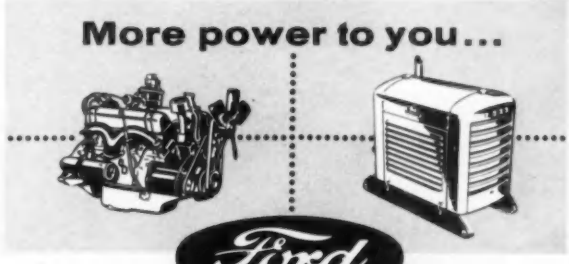
designed for maximum payloads... and dependable, economical operation!

It's easy to see why Etnyre chose a Ford Industrial Engine for their FX-500 "Black Topper" . . . Ford engines deliver the kind of peak performance that construction work requires. Dependability and economy of operation are just *two* of the many advantages enjoyed by OEM's using Ford Industrial Engines. They're *compact* engines, allowing greater freedom of equipment design, and delivering *more horsepower per pound of engine weight than ever before possible!*

Parts and service availability is *immediate*, with a nationwide network of Ford Dealers carrying a complete stock of more commonly purchased engine parts.

Only Ford offers a full line of modern, overhead-valve design engines to meet every power requirement.

Ford engines range from 134 to 534 cubic inches, including modern diesels. Most of these engines are available as foot- or skid-mounted power units. Whatever your industrial power need, it'll pay you to specify Ford Industrial Engines.



YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED!

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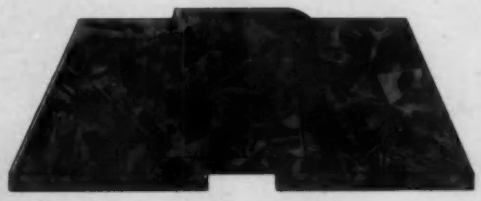
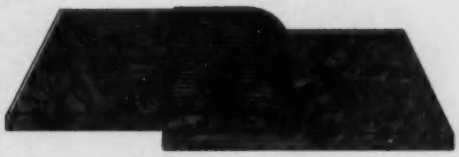
OUR CHALLENGE STANDS! "Anything that can be made of steel sheets can be made of Wheeling SOFTITE Sheets!" This tough, dependable galvanized coating performs perfectly . . . *can't* flake or peel even during the difficult fabricating operations shown on the right. See your Wheeling man . . . or write for full details to Wheeling Steel Corporation, Wheeling, West Virginia.



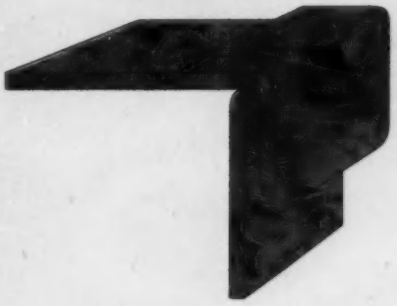
Spot-weld it!

Paint it!

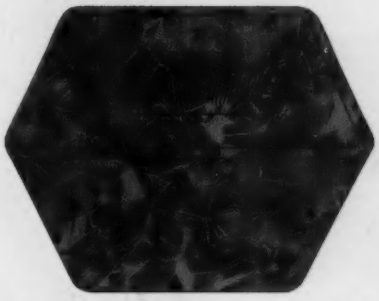


Solder it!

Fold it!



Lock it!



Deep-draw it!

Spin it!

It's Wheeling Steel!

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make your plastic parts

There are hundreds of companies in the United States who are ready to guide you in every phase of plastic product development. They're called custom molders . . . companies who buy plastic resins from producers like Koppers, then process the resins into finished plastic products.

Custom molders know exactly what plastics can and cannot do. They make sure you use the right plastic, that processing equipment works as it should, and that your product is manufactured at a competitive price. Many automotive designers have already contacted custom molders for advice on the 200 plastic parts they put in some of the 1961 models.

For a list of custom molders of polyethylenes and polystyrenes, write or call our Detroit Sales Office, 301 W. Eight Mile Road, Detroit 3, Michigan. Telephone: FOrest 6-5200. Or write directly to Koppers Company, Inc., Plastics Division, Dept. 116, Pittsburgh 19, Pennsylvania.

Koppers makes these fine plastics: DYLITE® expandable polystyrene, DYLENE® polystyrene, DYLAN® polyethylene and SUPER DYLAN® high-density polyethylene.

KOPPERS PLASTICS

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stainless steel adds sales appeal.
the car designed with stainless steel looks better when you buy it and is worth more when you sell it.

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As suppliers to every major passenger car manufacturer, Sackner has developed a wide range of products for upholstering, padding and trimming automotive body interiors. Most of these were engineered to fill a specific need . . . to solve a particular problem. We have 45 years experience . . . all the necessary know-how to engineer fibre and plastic material to meet your need . . . let our experienced Product Development Staff assist you! Submit details of your requirements, today, for free analysis and recommendation.

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- **PAPER COVERED WIRE STAKE** Steel wire with a twisted kraft cover, for stabilizing spring assemblies. Strong and "squeak-proof."
- **PLASTIC EXTRUSIONS** Decorative trim or functional parts in any shape, length, size, color or degree of hardness specified. Complete engineering service.
- **BODY DUST SEALS** Large-diameter cellulose cords, with braided jacket, to seal off welded seams, etc. Uniform in shape and density.

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1-4

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The Role of Inspection

(*Continued from page* 116)

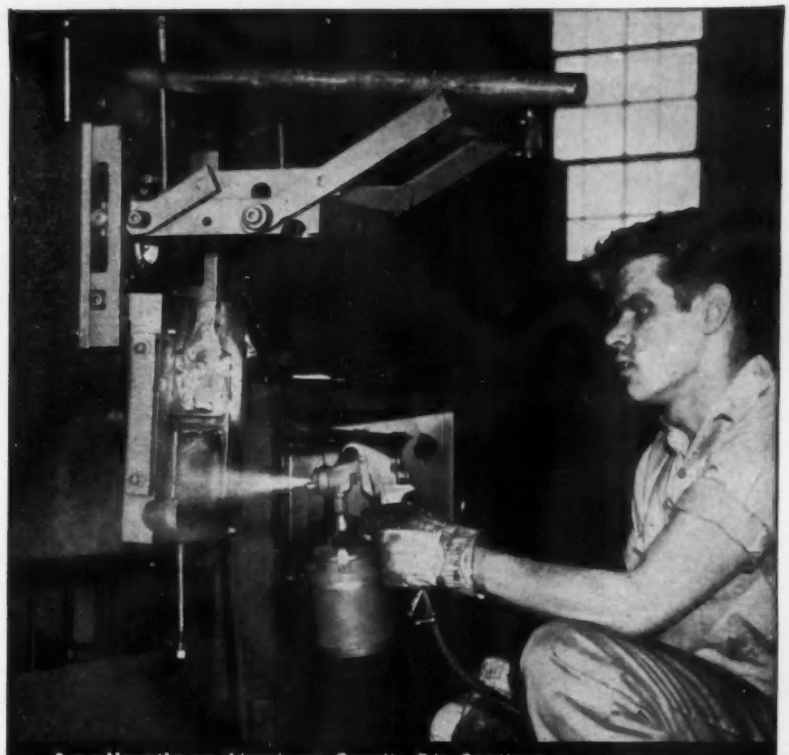
agencies involved in the prevention of defects. And the prevention of defects, of course, is the ultimate aim of every good quality-control program.

Inspection — effective inspection —is difficult to accomplish. Let's take a minute to review just how difficult it is. To begin with, it is a physical impossibility to inspect all parts for all possible defects. A simple bolt has specifications for the metal it is made of, as well as for head, length, diameter, and threads. As for the other parts that go into an automobile, there are about 15,000 of them. Allowing only five types of defects per part, we are talking about 75,000 potential defects per car. To get an idea of the tremendous job quality-control does in the automotive industry every day, consider that last year's domestic production by the five major companies totaled over 7½ million cars and trucks, or about 30,000 units every working day.

In addition to complexity and volume, automotive manufacturing has certain other characteristics that make inspection difficult. For example, there is the large number of processes—to name only a few, casting, forging, machining, stamping and welding. There is the large size of some of the parts that must be built and channeled in an unalterable sequence to the assembly line—doors, windshields, and engine assemblies. And there is the annual model change-over not to mention the occasional introduction of a brand-new line of cars.

All of these characteristic of automotive manufacturing create formidable inspection problems, but as we all know, they can be solved. Certain well-established practices enable us to bring the manufacturing process under control — enable us to achieve high quality-standards and hold quality-costs down. You know these practices as well as I do. If we cannot possibly inspect for all defects, we can inspect for significant defects. And we can give the responsibility for listing significant defects to quality-engineers, who are specialists at solving problems involving quality-costs and quality-standards. We

DIE CASTING REPORT



Application: *Aluminum Gravity Die Castings.*

Problem: *To obtain a micro-smooth surface finish.*

Solution: *'Aquadag'® and 'dag'® Dispersion 193—diluted with water in varying ratios depending upon the job requirements; spray-applied.*

RESULT: *SURFACE FINISHES ON ALUMINUM CASTINGS AS SMOOTH AS 40 to 60 MICROINCHES*

Akron Gravity Die Casting Company, Akron, Ohio, has built a reputation on products with exceptional surface quality. These micro-smooth finishes . . . comparable to a tool room grind . . . have been insured by using Acheson's 'Aquadag' as a parting agent and 'dag' 193 as an insulating coating. By using the materials in these separate functions, Akron Gravity is able to achieve proper metal flow throughout the die cavity — eliminating deposit build-up, premature solidification, and metal-to-metal alloying. As a result they get both better casting surface finishes and longer die life.

The consistent uniformity, quality performance, and versatility of Acheson mold coatings for metal casting, are covered in Bulletin No. 425. Send for your copy, care of Dept. AI-61

ACHESON — First name in solid lubricants for fifty-three years.

ACHESON Colloids Company

PORT HURON, MICHIGAN

A division of Acheson Industries, Inc.

Sales offices in principal cities.

Also Acheson Industries (Europe) Ltd. and affiliates, London, England

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can establish sampling plans which are flexible enough to accommodate rapid increases or decreases in the number of items that must be inspected and which can easily be inaugurated or withdrawn, depending on costs, manpower, and the level of assurance required. We can keep ourselves in a state of readiness by maintaining inspection audits of potential defects which are not currently significant, but which may become so. And we can carry on broad educational programs aimed at preventing defects.

These and similar techniques are the foundation for any sound inspection system. What of the inspector himself? Well, like you and me he's human. He doesn't have unlimited stamina and unlimited ability, and he makes occasional mistakes. For example, he may thoroughly understand and discharge his responsibility to reject bad parts. But, wanting to play it safe, he may stumble over his responsibility not to reject satisfactory parts. Such stumbling is most likely to occur in those areas requiring non-dimensional quality judgments—for example, paint finish, alignment of hood to fenders, and interior trim.

Whether an inspector's errors result from invariably playing it safe in borderline cases or from other causes, such errors are costly in terms of both scrappage and misleading data. Agressive quality-control management, therefore, makes every effort to develop highly competent inspectors.

We have made tremendous proggress in this direction. There was a time when inspection was known as a kind of dumping ground. In the old days, if a man wasn't able to do anything else — if he wasn't able to maintain machinery, operate a lathe or drill-press, or assemble two parts properly—that man too often found his way into an inspector's job. The slow, the inept, the irresponsible—all, whatever their shortcomings on other jobs, were thought to be capable of handling the job of inspector.

Those management decisions which abolished the dumping ground were key decisions. They brought rising standards for inspectors. In a manner of speaking, they injected quality into quality-control—and at the point where it was most needed. In the long run, a company gains strength in the market only by the quality of its products. And competent inspectors contribute as much as any other group of employees within a company toward getting quality.

Competent inspectors do more. They help get quality at the lowest possible cost—another imperative if a company is to prosper. One way to point up the greatest value of sound inspection as a means of holding quality costs in line is to visualize how expensive unsound inspection can be. Let's take a look at a hypothetical case. If by some rare mischance a color-blind inspector should get the job of inspecting fabrics, from time to time he doubtless would O.K. mismatched colors for installation.

What would the result be, say, in the case of a mismatched head-liner? Well, roughly the initial cost of installing a head-liner in one of our car-lines is $2.37. But if a head-liner is put in and then later in the assembly process has

NEW!

Johnson TAPPETS

SKEL KAST

This latest tappet improvement represents still another advancement brought about by the constant search for better design, materials, and manufacturing methods at Johnson Products. The reason? *Better tappets are our only concern.* We welcome the opportunity to put our engineering and test facilities at your disposal. Johnson Products Inc., Muskegon, Michigan.

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.

Steel *for Strength . . . Economy . . . Versatility*

Flame-Hardening Alloy Steels

The process known as flame-hardening involves the direct application of flame to the surface of steel, heating it above the transformation range, then hardening it by quenching. The primary purpose of this process is to achieve surface-hardness without affecting core properties. Jets of flame are played directly on the steel, and hardness penetration can be made to vary considerably. In alloy steels this depth will range usually from 0.03 to 0.12 in., the actual figure depending upon the method of heating and quenching used.

Unlike carburizing, flame-hardening does not involve the absorption of extraneous elements by the steel. There is no alteration of the chemical composition. To put it simply, the steel must have its own self-hardening characteristics; it cannot be dependent upon carbonaceous salt baths, gases, and other media.

Flame-hardening is not a substitute for the conventional furnace method. Each has its uses. The particular virtue of flame-hardening is that the flames can be directed to localized areas. The furnace, on the other hand, is generally more economical and feasible when parts produced in large quantities must be hardened all over.

Any type of hardenable steel, alloy or carbon, can be flame-hardened, and there will usually be no scale or pitting. The alloy content is the governing factor when determining the quench. In some cases a rapid quench is required; in others, it can be as slow as air-cooling. Tempering presents no problems, for flame-hardened steel can be tempered as if hardened to the same degree by other methods.

A list of typical flame-hardened parts includes such familiar items as gear and sprocket teeth, and certain types of cams and rollers, and shoe treads. A complete list would include many other parts that often require a localized hardening treatment, especially for wear-resistance.

When you need information about flame-hardening methods, please feel free to consult with our technical staff. Bethlehem metallurgists will work with you, at no obligation, and you can depend on their suggestions. You can rely on Bethlehem, too, as a source of alloy steels . . . for Bethlehem makes the complete range of AISI standard grades, as well as special-analysis steels, and all carbon grades.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Sales:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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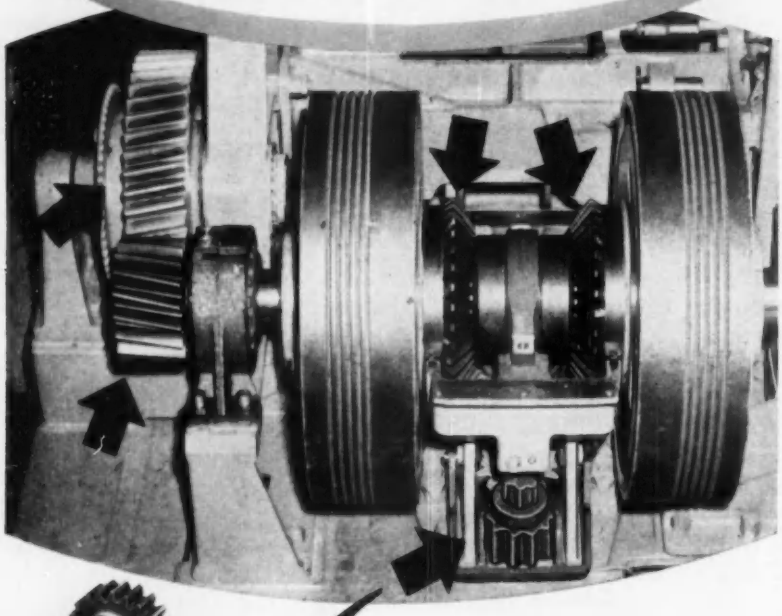
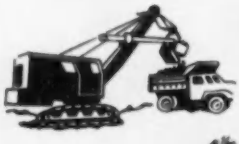
Do You
have requirements for
"Special Gears?"



CHECK with
FAIRFIELD!



"Fairfield has furnished us with bevel and spur gears for many years and we are highly satisfied with their product," states one of America's best known makers of shovels, cranes, and draglines in referring to the above picture. Each gear (*see arrows*) is precison produced to match this builder's specifications for *plus value* quality.

Making gears to meet exacting specifications is our business. The special or unusual requirements you have for design, size, finish, tolerances, materials, and heat treatment are often "standard" at FAIRFIELD. Here, every facility needed is available for production of fine gears EFFICIENTLY, ECONOMICALLY. *LARGE or SMALL, your inquiry will receive prompt attention.* CALL or WRITE.

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Gears and Differentials Made to Order for:

TRACTORS • HEAVY DUTY TRUCKS • AGRICULTURAL MACHINERY • POWER SHOVELS AND CRANES
MINING MACHINES • ROAD GRADERS • BUSES • STREET SWEEPERS • INDUSTRIAL LIFT TRUCKS

to be replaced, the cost rises to over $23, or about ten times the initial cost. Moreover, if the later inspector who spots the mismatched head-liner should fail to classify it properly—if, for example, he should classify the head-liner merely as damaged instead of mismatched—the color-blind inspector would continue merrily on his way, letting through interiors with very odd color combinations. In fact, it might be some time before his supervisors—or for that matter he himself—even knew that he was color blind.

Admittedly, this example is extreme. But the cost figures are not extreme. And it requires no great imagination to apply similar cost figures to all areas of the manufacturing process—in the automobile industry or any other industry—and to realize how much poor inspection standards can cost a company.

Good managers—aware as never before of the vast importance of getting accurate and fast inspection information — are taking the necessary steps to secure that information. They are exercising great selectivity in filling inspector jobs, and many companies require applicants to take formal competitive examinations. They are maintaining extensive training programs for inspectors already on the job. They are tightening up the liaison between the quality-engineer and the inspector. And they are following up with close supervision of the entire inspection activity.

The inspector himself is also gaining greater awareness of the importance of his activity, especially with regard to the reporting of accurate data. In fact, feeling the heavy responsibilities laid on him, he sometimes sounds off like the army private who observed: "They want me to win the whole damn war, but there's nobody for me to give orders to." Actually, however, the inspector has much to say about winning his war for high quality. He has inspection instruction sheets which not only describe his job, but also enable both him and his supervisors to evaluate his efficiency. He has audits of previous production to use as a guide. He has the O.K. stamp to use or

(*Turn to page* 132, *please*)

Circle 174 on Inquiry Card for more data

Circle 175 on Inquiry Card for more data ⟶

Ingersoll CROSS-ROLLED Clutch Steel Helps Move the Earth

To meet the punishing demands of off-highway equipment, Ingersoll Steel Division melts, CROSS-ROLLS, and processes to customer specifications, special analysis clutch steel. In short, Ingersoll can:

- **Melt (electric furnace) steels to special analyses**
- **CROSS-ROLL ingots to sheet and light plate**
- **Blank or shear**
- **Produce rings with internal or external teeth**
- **Rough and/or finish grind the surfaces**

Ingersoll clutch steel is also widely used in the automotive and tractor industries.

Write for Ingersoll's new full-color facilities and products brochure: "Experts in Specialty Steels."

Ingersoll's gear shapers, hobbing machines and surface grinders produce precisely finished clutch plates to customer specifications.

INGERSOLL B-W STEEL

Ingersoll STEEL DIVISION

Borg-Warner Corporation

NEW CASTLE, INDIANA

Let us help you save weight and space in your new designs with OTC high-pressure hydraulics

PUMPS

Two-stage "Vanguard" complete pumping units, in 6,000 p.s.i. and 10,000 p.s.i. models handle high force requirements yet provide *fast* ram approach and return (i.e. 600 cu. in./min. @ 100 p.s.i.). Portable — in electric or gasoline engine models. Many choices of controls and accessories.

High-volume, high-pressure radial-piston pump delivers up to 220 cu. in./min. at 10,000 p.s.i. Electric motor driven.

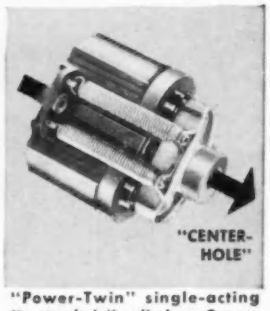
Two-speed hand pump (10,000 p.s.i.) delivers high volume in low pressure stage (7.3 cu. in./stroke up to 200 p.s.i.), yet provides needed low-volume power for high force needs.

Versatile, lightweight hand pump — single-speed, single-piston. Develops up to 10,000 p.s.i.

CYLINDERS

Double-acting cylinders with choice of stroke length. Bores 1½" to 6⅜", capacities from 8 to 150-tons at 10,000 p.s.i.

Double-acting "center-hole" cylinders with choice of stroke. Bores 1½", 2", 2½"; from 17 to 50-tons at 10,000 p.s.i.

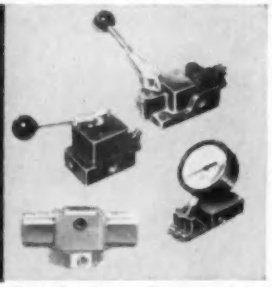


"Power-Twin" single-acting "center-hole" cylinders. Capacities 17½, 30, 50 and 100-tons at 10,000 p.s.i.

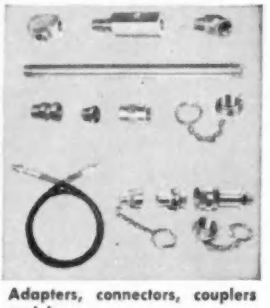
Single-acting cylinders. Bores ⅞" to 3½", capacities from 2 to 50-tons at pressures up to 9,500 p.s.i.

Special hydraulic cylinders made to order. We invite you to send us your high-pressure design requirements.

ACCESSORIES



Control valves — 2-way and 4-way, manual or solenoid—pressure switches, remote controls and gauges.



Adapters, connectors, couplers and hose.

Pioneers in the design and manufacture of high-pressure hydraulic (oil) products (up to 10,000 p.s.i.), OTC now offers an expanding line of lightweight, compact pumps, complete power units, single and double-acting cylinders, valves and accessories for O.E.M., production and maintenance. If your new design requires a special hydraulic component, OTC's staff of experienced hydraulics engineers are ready to serve you. We request the opportunity to work with you in utilizing the benefits of high-pressure hydraulics in your special design programs. Write for complete information, and ask for our free "PHD" catalog.

PRECISION HYDRAULICS DIVISION
OWATONNA TOOL COMPANY

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Designers and manufacturers of the world's most complete line of Maintenance Tools and Hydraulic Equipment

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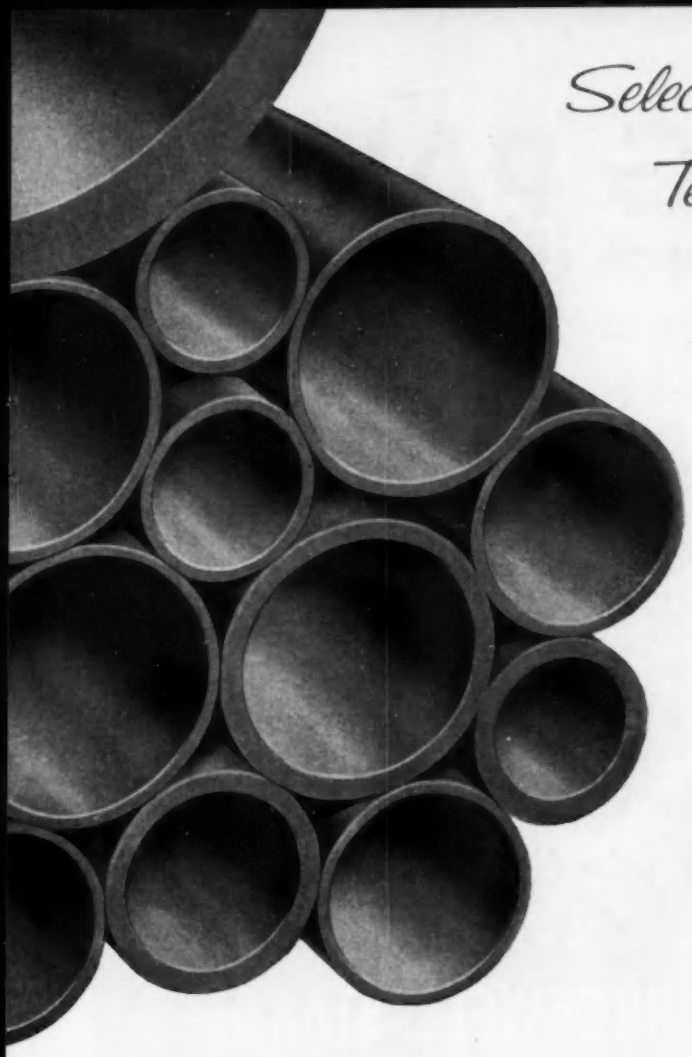
Circle 176 on Inquiry Card for more data



Selection of finest raw materials

Testing every step of the way

Inspection to rigid standards

Assure 100% dependability for

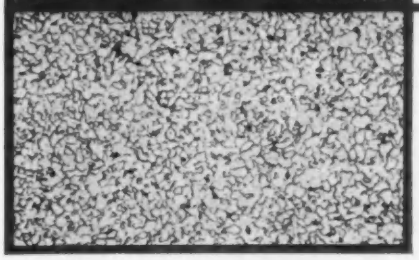
OHIO WELDED PRESSURE TUBING

You can be sure — doubly sure — of utmost tubing dependability when you specify Ohio Welded Pressure Tubing — *made by Ohio Seamless.* First, Ohio works to accepted industry standards — ASTM, ASME, and similar Federal and military specifications covering welded pressure tubing. Second, Ohio Welded Pressure Tubing is produced under a *continuous* process of quality control — not just a final test inspection to cull questionable material.

Carefully selected prime raw material is slit, edged, shaped and electric resistance welded on the most versatile and modern equipment in operation. At each and every step of the way Ohio Welded Pressure Tubing is under the scrutiny of Ohio's master tubemakers . . . making control tests at frequent intervals . . . testing random samples from each production order far beyond the limits of the usage involved.

For critical pressure piping applications . . . for condensers, heat exchangers, boilers and superheaters — in the range of sizes from ½ to 7½" OD and wall thicknesses from .028 to .375"— mark your prints "*Ohio Custom Made Welded Pressure Tubing.*" There is no equivalent.

Photographs show flare, flattening and crush tests performed continuously on every order. Non-destructive tests include air, water, magnetic, eddy current and visual inspection to insure 100% dependability.



Photomicrograph of polished and acid-etched surface shows perfect microstructure of normalized Ohio Welded Pressure Tubing. Weld area running down the center is now indistinguishable and tube has become, in every sense, weldless.

OHIO

OHIO SEAMLESS TUBE

Division of Copperweld Steel Company

SHELBY • OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

Representatives in principal cities. Check leading directories:
THOMAS', MacRAE'S, CONOVER-MAST, SWEET'S, FRASER'S.

A-4800A

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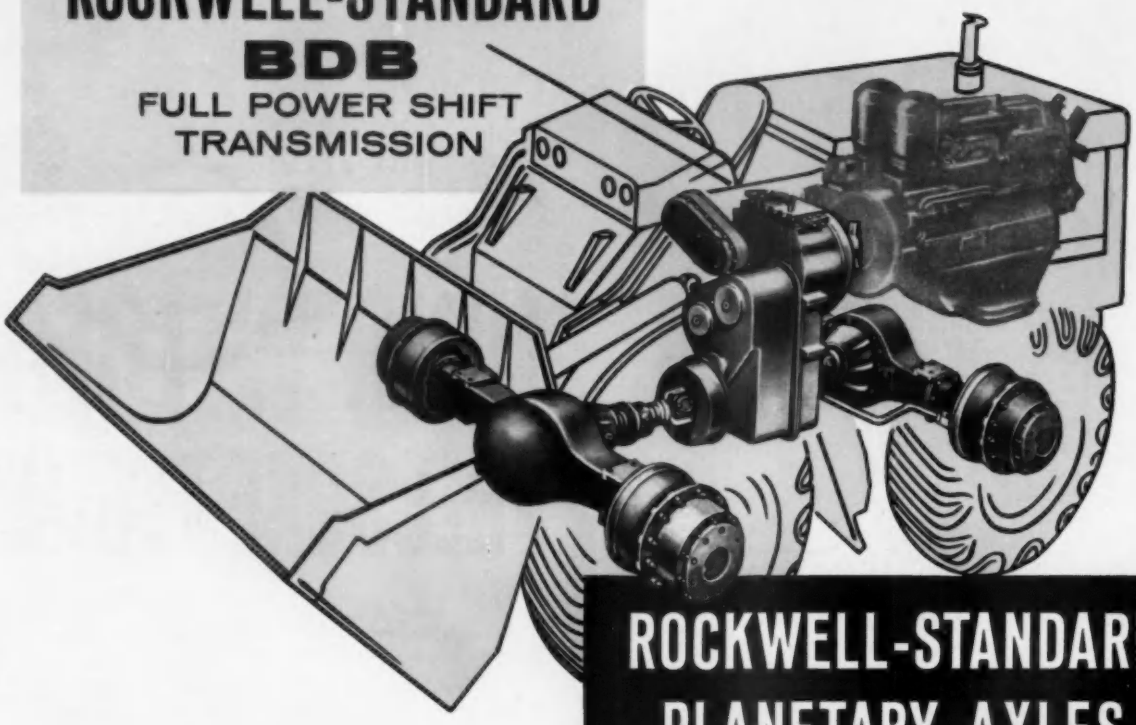
WINNING PAIR for

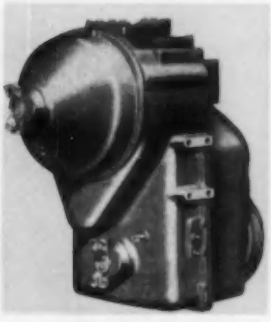
PROFIT • PERFORMANCE • DEPENDABILITY

ROCKWELL-STANDARD
BDB
FULL POWER SHIFT
TRANSMISSION

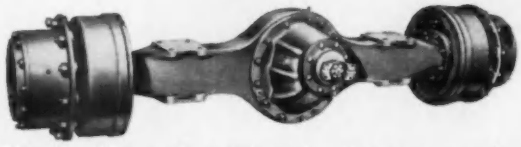


ROCKWELL-STANDARD
PLANETARY AXLES

Loaders and similar heavy-duty vehicles teamed with these components are "computer applicated" for a winning performance. Optimum traction, acceleration and power utilization *assure faster work cycles with larger per hour profits.*



Rockwell-Standard type BDB Hydra-Drives transmission combines in one package the desirable features of a hydraulic torque converter and full power shift transmission with compact "built-in" drop box construction. Clean, rugged, four-speed countershaft design reduces maintenance costs. Built to last, it contains up to 35% fewer parts, is easier to understand and quicker to service.



Rockwell-Standard Planetary Axles assure dependable, rugged, efficiently designed units capable of maximum performance on any heavy duty operation. Exclusive features provide equal distribution of loading to all planetary gears—a minimum of maintenance—constant lubrication of all parts—and a full range of capacities in rigid and steering axles.

Another Product of... **ROCKWELL-STANDARD CORPORATION**

ROCKWELL R STANDARD

Transmission and Axle Division, Detroit 32, Michigan

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This mark tells you a product is made of modern, dependable Steel.

Now Available...

USS QUENCHED AND TEMPERED STRUCTURAL SHAPES

in such grades as "T-1", "T-1" type A, 9% Nickel and HY-80 Constructional Alloy and Armor Steels

Announcing another industry "first" for United States Steel—USS Quenched and Tempered Alloy and Armor Steel Structural Shapes are now commercially available for the first time anywhere, in the types and sizes shown in the accompanying tables. The more commonly used sizes of American Standard Beams, Channels, Equal Angles and Unequal Angles will be produced in these USS Steels: "T-1", "T-1" type A, 9% Nickel, HY-80 and certain other alloy grades that provide desirable mechanical properties after quenching and tempering. Later, other sizes and shapes will be added according to demand.

These quenched and tempered alloy and armor steel structural shapes (see table below) can simplify design and result in substantial weight savings, increased structural strength and reduced shipping and handling costs. For a free folder about any of these steels or their structural shapes, contact your local USS representative or write to United States Steel, Room 6315, 525 William Penn Place, Pittsburgh 30, Pa. USS and "T-1" are registered trademarks

United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal & Iron Division • United States Steel Supply Division • United States Steel Export Company

Availability Quenched and Tempered standard structural shapes are available in the following shapes and sizes:

I	Beams: 6″ to 12″ inclusive	American Standard Sections and Foot Weights*
[	Channels: 6″ to 15″ inclusive	American Standard Sections and Foot Weights*
L	Equal Angles: 3″ to 8″ inclusive	Standard Sections*
L	Unequal Angles: 3½″ x 3″ to 8″ x 6″ inclusive Maximum Length 40′ for all sections	Standard Sections*

*See our booklet, "USS Shapes & Plates," ABUCO-2700

Mechanical Properties of Quenched and Tempered Alloy and Armor Steel Structural Shapes

	Yield Strength, psi	Tensile Strength, psi	Elong. in 2″, % min.	Reduction of Area, % min.	Longitudinal Charpy Impact (when specified)	
					Keyhole	V-notch
"T-1" Steel 2½″ and Under	100,000 (min.)	115,000/140,000	18	55①	15 ft.-lbs. @ −50F	30 ft.-lbs. @ +10F
"T-1" type A 1″ and Under	100,000 (min.)	115,000/140,000	18②	45②	15 ft.-lbs. @ −50F	—
Grade A 9% Nickel	60,000 min.	90,000 min.	22% min.	—	15 ft.-lbs. @ −320F	20 ft.-lbs. @ −320F
Grade B 9% Nickel	65,000 min.	95,000 min.	20% min.			
HY-80 ¼″-2″ Incl.	80,000/100,000③	—	19④	—	—	70 ft.-lbs. @ − 20F

①¾″ and under—45% min.
②½″ and over, yield strength range is 80/95,000 psi
③¾″ to 1″ inclusive, elongation 16% min.
④½″ to 2″ inclusive, elongation 20% min.
⑤¾″ to 1″ inclusive, 55% min.

USS United States Steel

SCOTT
OUTBOARDS

VICTOR-Sealed
Right and Tight!

For maximum power output . . . efficient carburetion and cooling . . . tight lubricant retention and water exclusion . . . Scott Outboard Motor engineers specify these typical high-quality Victor gaskets and oil seals:

- **VICTOCOR®** soft-packing, metal-core, cylinder head gasket
- **VICTOPLATE** fiber and synthetic rubber shim gasket
- **CORBESTOS®** steel-core asbestos power head adapter gasket
- **VICTOPAC®** asbestos-synthetic rubber cover plate gasket
- **ASBESTOPAC®** asbestos-synthetic rubber drain cover gasket
- **VICTORITE®** treated plant-fiber packing carburetor adapter gasket
- **Type K31 VICTOPRENE®** limited-space application oil seal for water and bailer pumps
- **Type K4 VICTOPRENE®** dual-lip oil seal for propeller shaft and crankshaft

Marine Power Sealing—a VICTOR Specialty
. . . WRITE FOR CATALOG

In standard gasket and oil seal designs, Victor gives you widest selection in all types. In nonstandard equipment, Victor offers 50 years' leadership in design, development and manufacturing. Comprehensive engineering catalogs supplied free. Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. Canadian plant: St. Thomas, Ontario.

VICTOR
Sealing Products Exclusively
GASKETS • OIL SEALS • PACKINGS • MECHANICAL SEALS
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The Role of Inspection

(*Continued from page* 126)

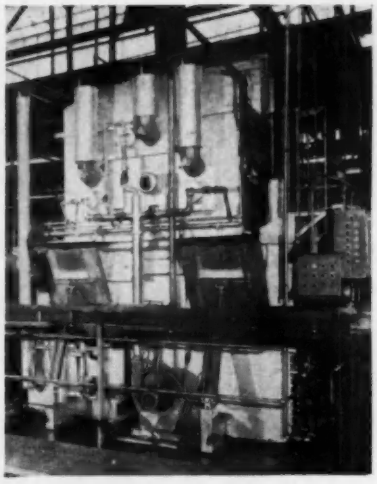
withhold. He has the reject-ticket. And he has re-inspection to determine the effectiveness of repairs.

The inspector can be a strong force for excellence in another way. And this brings me to the new idea I mentioned in my opening remarks, which is not so much a new idea as a new application of a very old idea—the human relations idea. To increase the effectiveness of the inspection system at Chrysler, we in quality-control are using the inspector in a special program which, so far as I know, doesn't exist at the other automobile companies. The program consists of regularly scheduled meetings which bring inspectors and production workers together in discussion groups of 40 or 50.

We've all heard — perhaps so many times that it has lost its edge —the saying: "You can't inspect quality into a part. Quality has to be built into a part." Well, it's as true now as it ever was. It is equally true that it is the production worker who builds—or fails to build—quality into a part. Our program, based on this principle, extends quality-control through the inspector, who passes or rejects the part, to the production worker, who makes the part—and it does so by means of frank and open discussion. Among other things, the inspector states what he is looking for and why. The production worker describes, say, the operation of his machine and the tolerances within which it can be expected to operate with maximum efficiency.

The program is simple, inexpensive, and effective. It is showing the kind of encouraging results that ought to be of great interest to everyone in quality-control.

Quality is fast becoming the watchword in America. The quest for quality is growing more intense in science, in education, in government, and in industry. For example, today in the automobile industry you find a deep awareness that now more than ever before, the customer is king—and as king he is demanding quality automobiles. Competition for his favor exists not just in automobile dealerships,



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For any of these processes:

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but in board rooms and laboratories, in design studios and supplier facilities, in assembly plants and—certainly — in quality-control organizations.

In the past, we in quality-control have helped give American motorists excellent cars. The proof lies in the 31 million cars five years old and over still on the road and still giving good service. In the future, we will help give American motorists even better cars. We have the system—and we have the will. We know that to the extent we are successful in building better cars, we help ourselves, our companies, and the whole American economy. ■

The foregoing is from a speech delivered by the author at a meeting of the Detroit Section of the American Society for Quality Control, Dodge Plant, Hamtramck, Mich., last January.

MORE GOVERNMENT CONTRACT AWARDS

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period May 1 to June 1 inclusive.

ALLIS-CHALMERS MFG. CO., DEFENSE PRODUCTS DIV., Washington, D. C.
Truck, fork lift, 16 ea.—$74,796

AMERICAN MOTORS CORP., Detroit, Mich.
Sedans, station wagons & trucks, 31 ea.—$41,083

AMERICAN MOTORS CORP., AUTOMOTIVE EXPORT DIV., Detroit, Mich.
Sedans & station wagons, 53 ea.—$72,865

AUTOMATIC TRANSPORTATION CO., DIV. YALE & TOWNE MFG. CO., Worcester, Mass.
Truck, fork lift, 29 ea.—$125,403

CHAMPION SPARK PLUG CO., Toledo, Ohio
Spark plugs, 25,200 ea.—$39,312

CHESAPEAKE MACHINERY CO., INC., Pasadena, Md.
Lathe, engine, 2 ea.—$29,992

CHRYSLER MOTORS CORP., Washington, D. C.
Motor vehicles, 304 ea.—$552,896

FIRE TRUCK, INC., Mount Clemens, Mich.
Trucks, various, 1 ea.—$6,975

FORD DIV., FORD MOTOR CO., Dearborn, Mich.
Truck, cargo, 130 ea.—$279,428

FORD DIV., FORD MOTOR CO., Washington, D. C.
Sedans, station wagons & trucks, 590 ea.—$1,064,608

GENERAL MOTORS CORP., FOREIGN DISTRIBUTORS DIV., New York, N. Y.
Light trucks, 11 ea.—$20,576

(*Turn to page* 136, *please*)

THE IDEAL PRODUCTION-LINE FASTENER

"POP" Rivets cut your fastening costs on the production line, because they're set from one side by one operator, using light-weight tools that are taken to the work. Rivets can be pre-positioned; setting is unusually fast and easy, with no danger of marring work surfaces, burring rivet heads, or stripping rivets from the work. Fastening quality and grip strength are uniformly high . . . and do not vary with the strength or skill of the operator. Setting tools are moderate in cost . . . and are available in manual, hydraulic and pneumatic types.

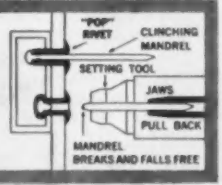
Remember, we've given you just one of the one dozen reasons why "POP" Rivets run rings around the rest. If you're interested in improving the quality, appearance and sales appeal of your products . . . and reducing fastening costs at the same time . . . be sure to investigate all the reasons that make "POP" Rivets the first choice for modern fastening.

Genuine "POP" Rivets are available through a large network of distributors throughout the country. Write today for complete information . . . and for the name of your local "POP" Rivet Distributor.

UNITED "POP" RIVETS

HERE'S HOW THEY WORK

"POP" Rivets are inserted and set from the same side: (1) Rivet is inserted in the work. (2) Jaws of the easy-to-use setting tool grasp the mandrel. (3) Tool is operated. Jaws pull back. Rivet is set. Mandrel breaks and falls free.



FASTENER DIVISION • UNITED SHOE MACHINERY CORPORATION
1637 River Road, Shelton, Connecticut, U.S.A.

Circle 181 on Inquiry Card for more data

MORE POWER PER POUND

WITH THE NEW SYNCRO ALTERNATOR

Newest, smallest, yet in alternators! Measures 7¼" dia. x 5¾" long, weighs only 26 lbs., yet delivers 1500 watts, 110 vdc, at 1600 rpm.

Designed for refrigeration trucks, taxicabs, police cars and similar heavy duty applications. Also available in 15 volts DC, 1000 watt rating and in AC models.

A semiconductor regulator, supplied as an accessory, holds output to ±2% over a speed range of 1000 rpm to 12,000 rpm. No-load to full load regulation is held to ±12%.

Features radially oriented ceramic permanent magnets in the rotor. No brushes, commutators or slip rings.

If you need auxiliary electric power from a tight space, write for more details about this compact Syncro Alternator.

SYNCRO CORPORATION
OXFORD, MICHIGAN

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MANUFACTURERS' NEWS

Tousey's New Plant

Ground has been broken for Tousey Varnish Co.'s $2.6 million paint and resin manufacturing plant at Northlake, Ill. Tousey produces a complete line of industrial finishes. Its general offices and chief manufacturing plant are in Chicago. C. R. Heagstedt, president, said the new plant will be part of a long range expansion program. Tousey has been a supplier of industrial finishes to the farm equipment and heavy duty road and construction machinery fields.

Mobay Expansion

Completion of expanded plant facilities at New Martinsville, W. Va., to increase production capacity for tolylene diisocyanate by nearly two-thirds has been announced by J. D. Mahoney, president of Mobay Chemical Co. Plans also have been approved by Mobay directors for immediate construction of a $1.5 million addition to be completed by fall.

Ford Modernization

Ford Motor Co. is undertaking a $2 million modernization program at its Woodlawn, N. Y. stamping plant. Ford officials said it was part of plans to achieve maximum flexibility of production facilities. Mark Kaiaander, plant manager, said 29 additional stamping and welding presses were being installed.

J. I. Case to Move

J. I. Case Co. plans to sell its Churubusco, Ind., plant and move manufacturing operations to its Burlington, Iowa, factory. The Indiana plant makes front end loaders and chassis and crawler assemblies for heavy duty tractors. Officials said the move was being made to improve efficiency and increase manufacturing capacity.

Yours for the ASKING . . . the ALL-NEW AI EDITORIAL INDEX Vol. 123

Covering issues from July 1 to Dec. 15, 1960, inclusive

Your copy of the newly revised Editorial Index is now available. This handy index saves valuable time in searching for specific subjects covered in the past issues of AUTOMOTIVE INDUSTRIES, and is made available to you as an additional service.

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Please send me, without charge, the new AUTOMOTIVE INDUSTRIES Editorial Index covering the 12 issues from July 1 to December 15, 1960, inclusive (Volume 123).

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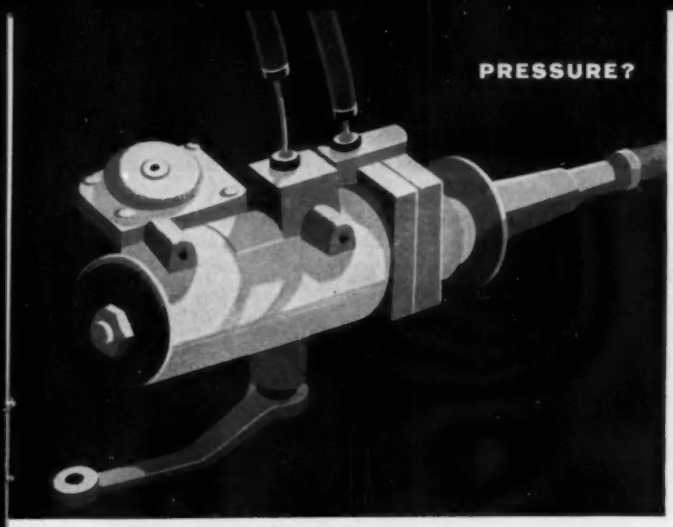
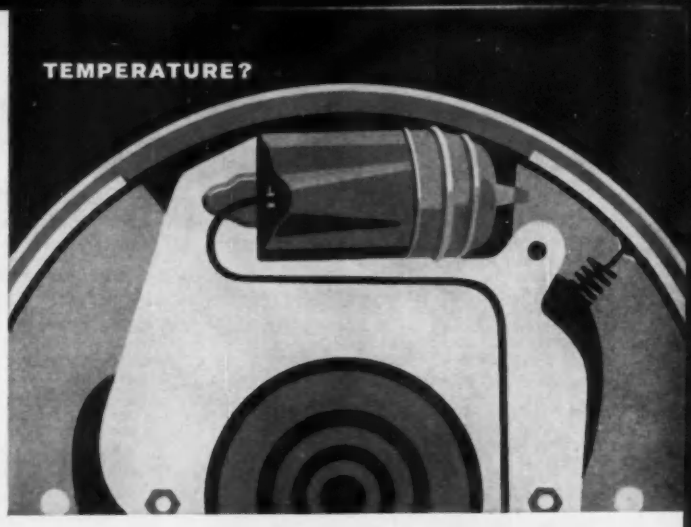
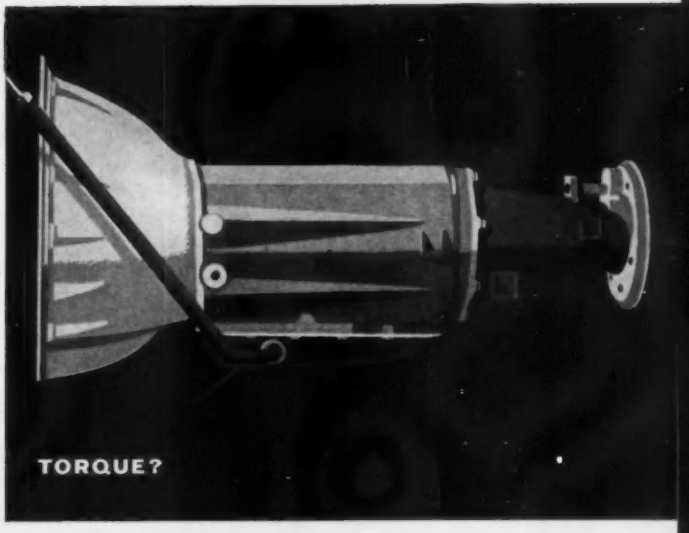






POWER PROBLEMS? . . . "tailored" hydraulic fluids meet new physical, chemical demands

New developments and designs in hydraulic systems frequently ask for fluid performances that aren't possible with present materials. And that's where the Dow Automotive Chemicals Laboratory can step in and "tailor" a fluid that will meet just about any physical or chemical need.

For many problems, a ready solution is frequently found by improving the existing formulation—for example, adding a thickener to alter viscosity characteristics. Other problems require a totally new material. Here's where the chemist has a special advantage—if he doesn't *have* the right fluid, he can *make* it! At the Dow Automotive Lab the chemists and automotive engineers are particularly well equipped to create new hydraulic fluids to extremely exacting specifications.

An example: a new Dow formulation was recently developed for a single central-power fluid to actuate steering, brakes, windows, and other accessories. To aid the Automotive Industry, the laboratory resources and experience are available to assist in particular problems.

With Dow's broad background in hydraulic fluid technology and a long list of glycols, Dowanol® glycol ethers, and other polyols, a ready answer to many hydraulic fluid needs may be achieved.

ENGINE COOLING. Ebullient cooling for passenger cars is under continuing research at the Dow Automotive Chemicals Laboratory. The increased flexibility of the system is expected to allow more freedom in the placement of radiators, for example, remote from their present location. This thought is intriguing to designers!

VORACEL® foamed-in-place, rigid urethane is showing real economic advantages over cut-and-paste batt applications. Application of the new water and chemical resistant foam may be either by a spray or pour operation for insulation, structural support, sound deadening, "pocket" sealing, and surface protection.

DOW AUTOMOTIVE CHEMICALS LABORATORY

Created expressly to serve the needs of the automotive industry, Dow's Automotive Chemicals Laboratory is active in technical service and development. This laboratory is continually researching and developing coolants, hydraulic fluids, cutting and grinding fluids, functional fluids, fuel and lubricant additives, and synthetic lubricants. To see how this laboratory can be of assistance to you, contact your nearest Dow sales office or write to Chemicals Merchandising in Midland.

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

MORE GOVERNMENT CONTRACT AWARDS

(*Continued from page* 133)

FORD MOTOR CO., GOV. SLS. DEPT., Washington, D. C.
Trucks, various, 12 ea.—$64,813
GENERAL MOTORS CORP., Pontiac, Mich.
Trucks, various, 1 ea.—$6,187
GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Motor vehicles, various, 908 ea.—$1,720,358
GENERAL MOTORS CORP., TRUCK & COACH DIV., East Pontiac, Mich.
Bus, motor, 43 ea.—$378,889
HEALD MACHINE CO., Worcester, Mass.
Grinding machine, cylinder, 1 ea.—$27,553
HESS CARRIAGE CO., Kansas City, Mo.
Truck, fire fighting, 24 ea.—$131,400
HIGHWAY TRAILER INDUSTRIES, INC., Edgertown, Wis.
Semitrailer, van, 24 ea.—$74,830
INTERNATIONAL HARVESTER CO., Chicago, Ill.
Tractors, wheeled, 34 ea.—$58,045
INTERNATIONAL HARVESTER CO., Washington, D. C.
Ambulance, 1 ea.—$5,339
INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks, various, 28 ea.—$175,040
INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks, various, 8 ea.—$44,615
JONES & LAMSON MACHINE CO., Springfield, Vt.
Lathe, turret—$64,993
R. K. LeBLOND MACHINE TOOL CO., Cincinnati, Ohio
Lathe, boring—$94,306
FRANK G. SCHENUIT RUBBER CO., Baltimore, Md.
Aircraft tires, 34,532 ea.—$1,066,364
STUDEBAKER-PACKARD CORP., South Bend, Ind.
Sedans, station wagons and trucks, 349 ea.—$513,315
TRANSPORT TRAILERS, INC., Cedar Rapids, Iowa
Semitrailer, 4 ea.—$70,567
WATSON AUTOMOTIVE EQUIPMENT CO., Arlington, Va.
Trucks, various, 4 ea.—$30,800
WILLYS MOTORS INC., Toledo, Ohio
Trucks, various, 74 ea.—$181,240
WISCONSIN MOTOR CORP., Milwaukee, Wis.
Engine, gasoline, 150 ea.—$67,822

MACHINERY NEWS

(*Continued from page* 87)

mediate saving to industry because recent spending on new equipment has been at a rate 50 per cent higher than tax writeoffs. Mr. Caplin said there is still a big job to be done in evaluating present depreciation practices and in determining the proper allowances which should be made. A survey recently completed by the Government on depreciation practices had a 75 per cent response from large corporations and only a 20 per cent response from small businesses—and the results may be open to question. Mr. Caplin concluded it is "apparent we cannot meet the challenge of foreign competition with obsolete plant and equipment . . . the foreigners have experimented and it remains to be seen whether we should experiment."

A recent action taken by the Export-Import Bank was mentioned by Harold F. Linder, chairman and president of the Bank, as being of particular interest to the machine tool builders. He advised that the Bank now offers political risk guarantees covering U. S. goods being exhibited in foreign trade shows. The coverage includes loss through war or civil war, expropriation, and restrictions on re-shipment. He further advised that the same kind of guarantee can be obtained on machines leased to foreign users.

Alternate Recommended for Investment Credit

Industry spokesmen, as a general rule, have voiced disapproval of the investment tax credit plan proposed by President Kennedy.

They feel the incentive thus provided would be inadequate to achieve the prime objective of stimulating, on a large scale, the modernization of America's production facilities. They also do not like the approach, nor its complexity.

Several alternate plans have been advanced. One of the latest is in a statement issued by the American Machine Tool Distributors' Association. Before setting out the AMTDA's recommendation, however, it might be well, as a starting point, to review the President's proposal.

President Kennedy, in presenting his special taxation message to Congress on April 20, made the following recommendation applying to investments in new machinery and production facilities:

The enactment of an investment incentive in the form of (1) a tax credit of 15 per cent of all new plant and equipment investment expenditures in excess of current depreciation allowances; (2) a tax credit of 6 per cent of such expenditures below this level, but in excess of 50 per cent of depreciation allowances; with (3) a tax credit of 10 per cent on the first $5000 of new investment as a minimum.

Now we come to the Distributors' recommendation, which was submitted in a recent letter addressed to The Honorable Wilbur Mills, Chairman, Committee on Ways and Means, House of Representatives:

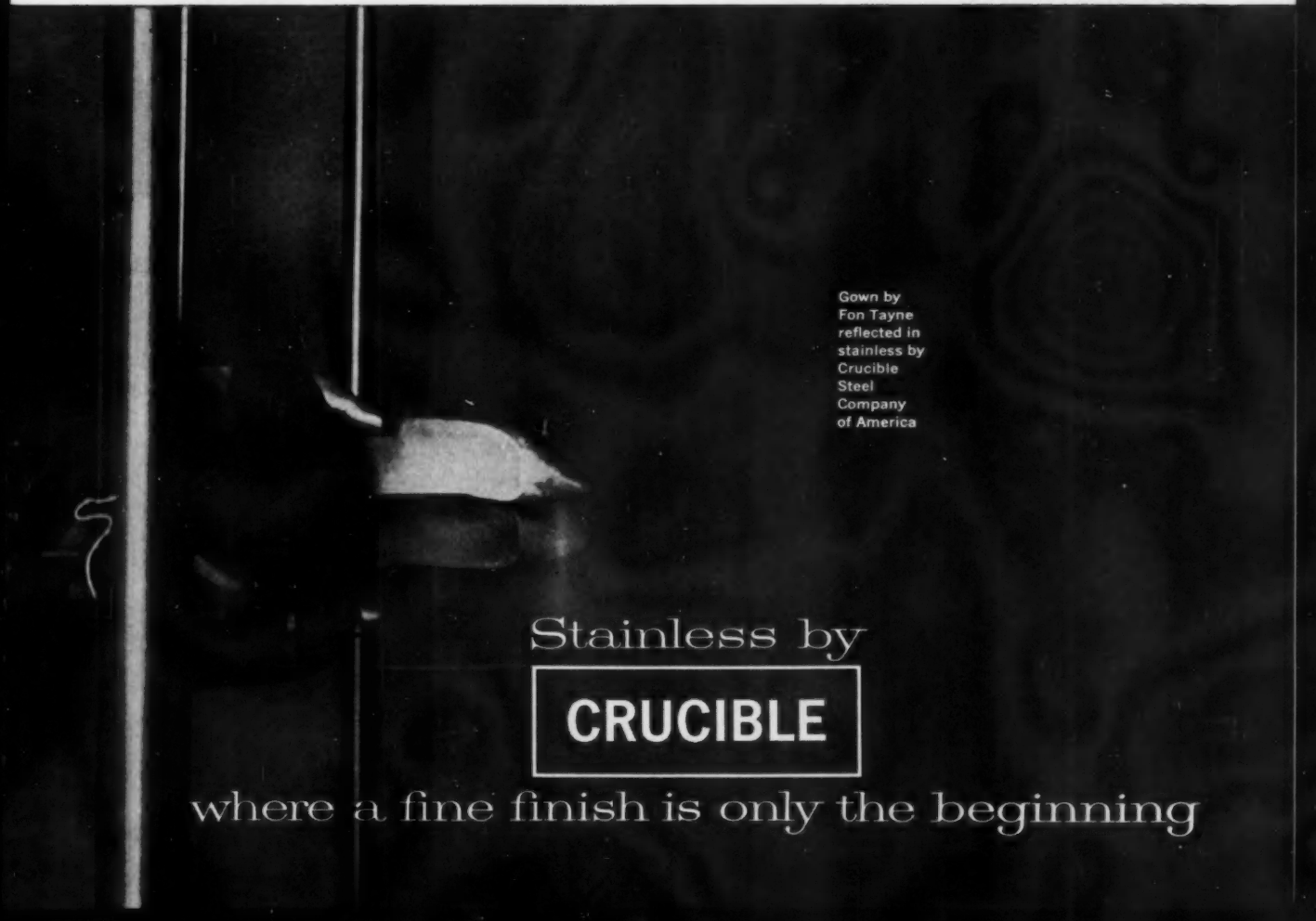
As a substitute for the tax credit plan, the Distributors recommend a straight - forward initial allowance deduction (or writeoff) of 30 per cent of the cost of new equipment.

The Distributors suggest it could be made effective by simply amending Section 179 of the Code to eliminate the present $10,000 and six-year useful-life limitations, and to raise the initial allowance rate from 20 to at least 30 per cent.

They believe this alternate plan provides the needed incentive, is simple to understand and administer, is equitable, and "eliminates uncertainties regarding taxes in future years." Also that it is compatible with "realistic depreciation reform" and, unlike the tax credit plan, has a "reasonable relationship to first - year obsolescence."

The Distributors called attention to an area of savings to the Government, saying they were confident that modernization of tools and equipment would reduce defense production costs enough to pay for a substantial portion of the revenue losses resulting from the proposed incentive depreciation.

The Distributors further expressed the opinion that the proposed initial writeoff plan was not the full answer — and that reform of the complete tax depreciation structure was still needed. They suggested that "top priority" be given to reform in this direction immediately following adoption of the recommended "first step." ■



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The Snyder Tank Corporation has manufactured over a million safety fuel tanks for all makes and models of trucks that travel on American highways and has maintained its engineering and modern manufacturing facilities to keep in step with the latest trends and requirements of the trucking industry.

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The Saddle Tank illustrated is designed to transport gasoline and Diesel fuel on a long haul and Snyder's balanced construction insures streamlined yet stronger tanks. Saddle Tank capacity—90 to 145 gallons.

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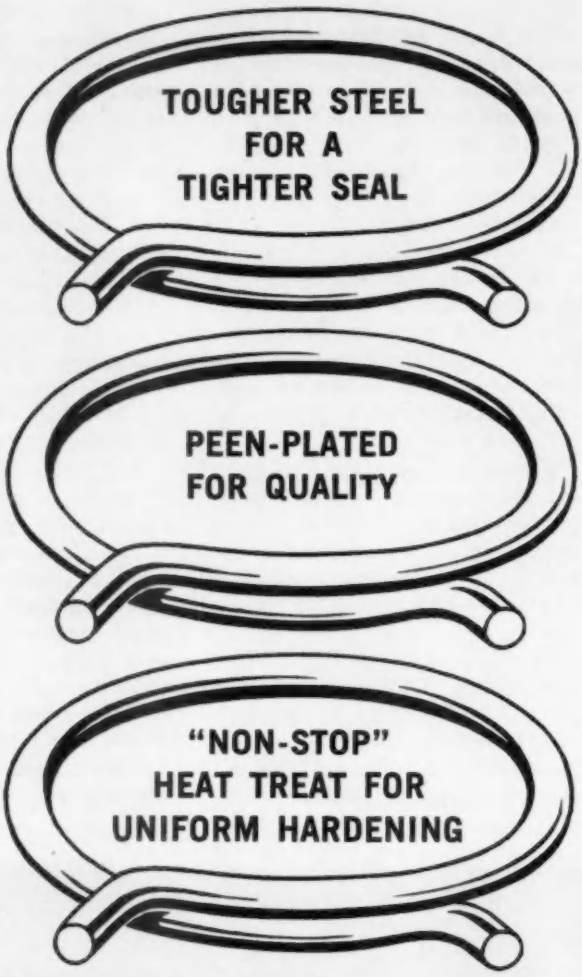

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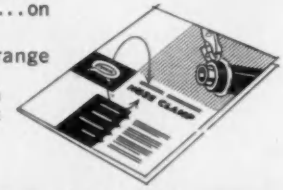

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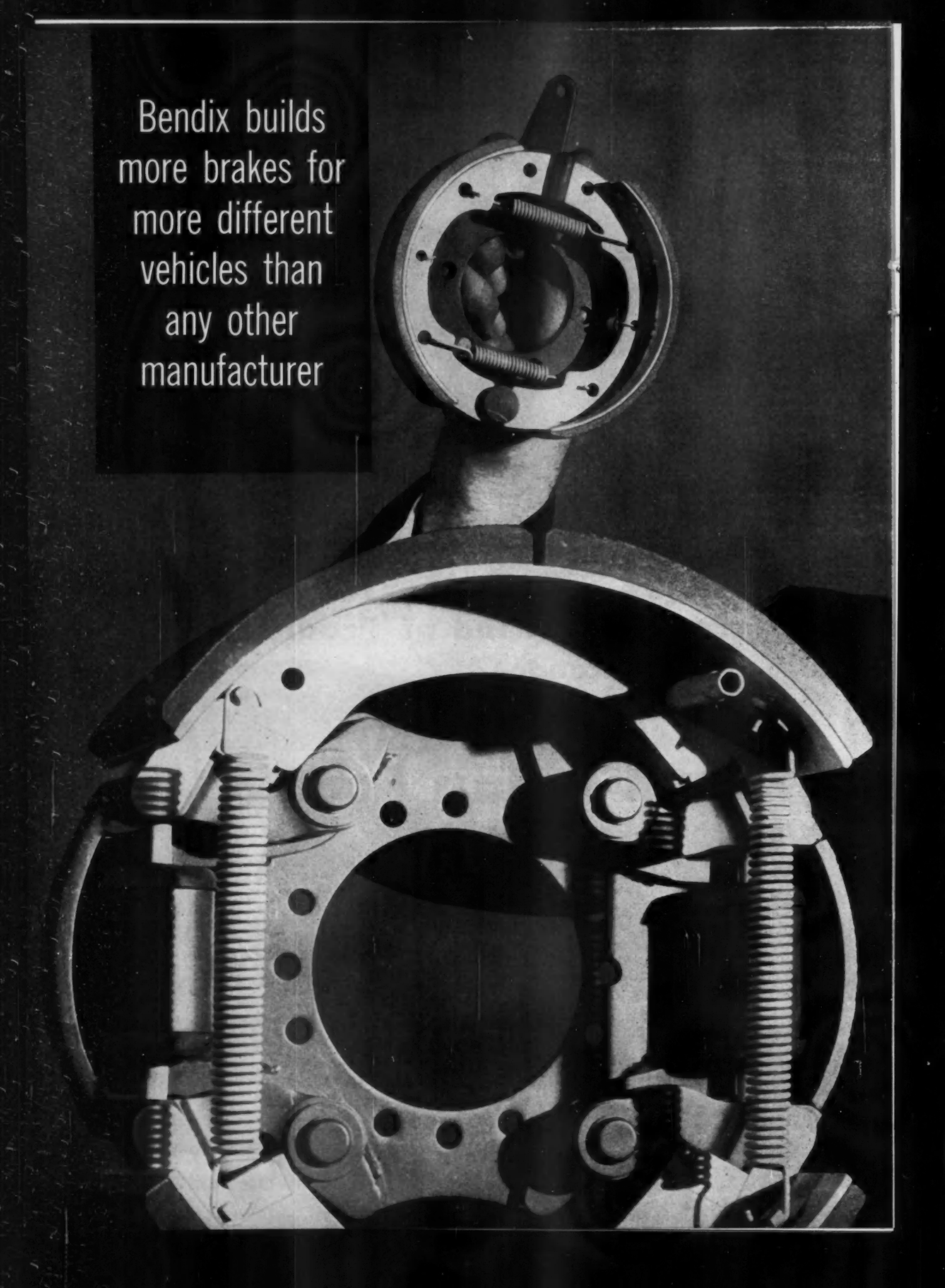

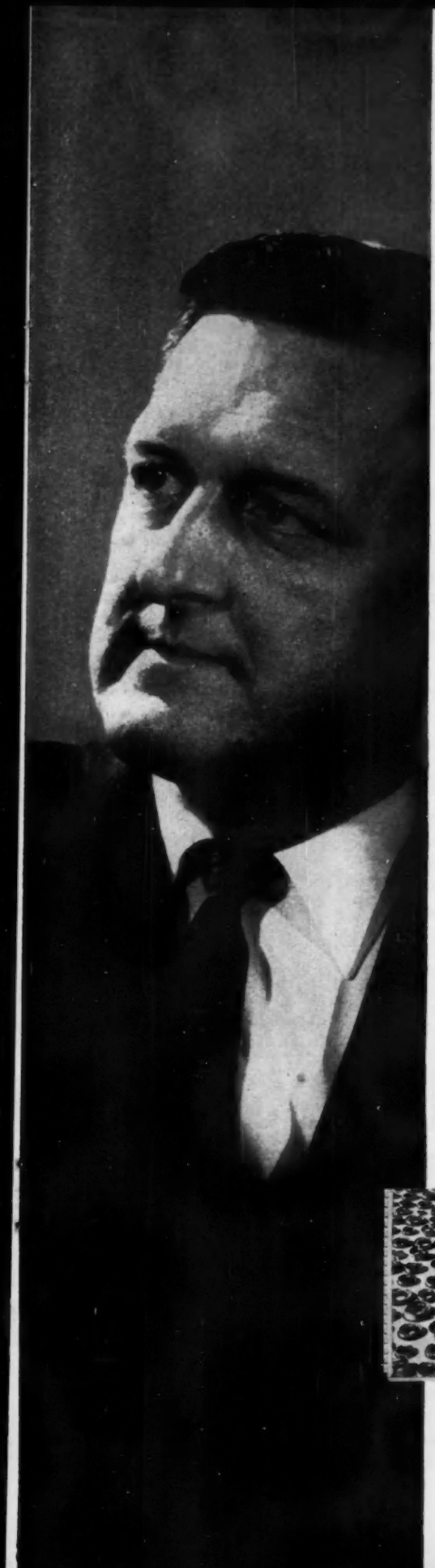

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ON OUR WASHINGTON WIRE

Congressional support for President Kennedy's stepped-up space program is growing by leaps and bounds. Even critics of other parts of the President's vast new spending program agree that the U. S. can hold back space spending no longer. In terms of spending this means $7 to $9 billion additional for space in the next five years.

Profits and prices in the farm machinery industry are getting a going over in Congress. A House Agriculture subcommittee is looking into the "cost-price squeeze" on farmers. Testimony indicates price rises have caused a hardship on many farmers.

A code of ethics for American business is being drafted by a group of U. S. clergymen, businessmen, teachers and editors. The group, the Business Ethics Advisory Council, is expected to draw up a single code for all business or different codes for different industries "that would be guidelines for them." Commerce Secretary Luther A. Hodges said.

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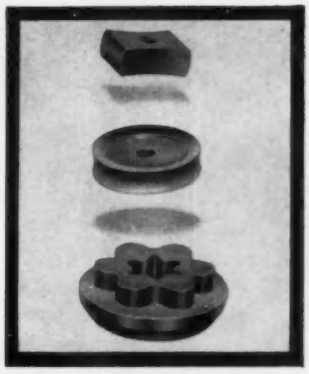

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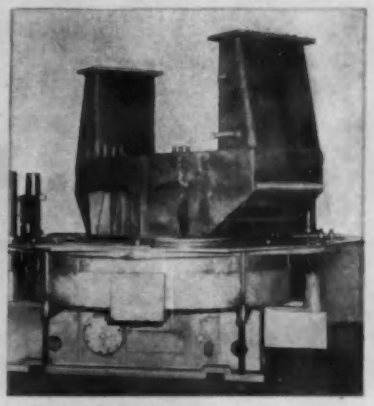
HIGH PRODUCTION RUNS or small lots—both turned out with *consistent* accuracy on a Lapmaster. Day-in-day-out production rates range from a few pieces to thousands per day.

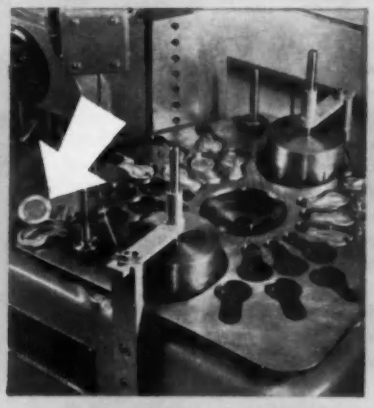
FLATNESS OF .0000116" or less with a micro-inch finish of 2 to 3 RMS is everyday work for a Lapmaster. Uniform accuracy maintained piece-after-piece because conditioning rings automatically keep lap plate flat.



4920 LB. PARTS can be handled—as well as small ⅛" dia. pieces. This 84" dia. weldment for a radar tracking antenna was lapped to a flatness and parallelity within ± .00005" on a Lapmaster Model 84.

TALL and SMALL PARTS AT THE SAME TIME. No expensive fixturing required... in most Lapmaster applications only inexpensive masonite or micarta work holders are necessary. Eliminates danger of stresses and warpage usually caused by clamping during grinding.

EXTERNAL and INTERNAL LAPPING IN ONE OPERATION. Versatility of the Lapmaster is demonstrated in this lapping operation on R. R. air brake parts. Reciprocating mechanism runs small lapping block in and out of work while other parts are being lapped on plate.



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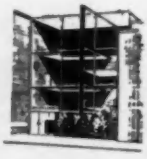
A CHILTON  PUBLICATION

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By C. J. Kelly
ASSISTANT EDITOR

Zinc Coating 1

Written in clear, understandable terms, this bulletin describes the galvanic principle of inorganic zinc protection, both in immersion and non-immersion service. Portions of the bulletin are devoted to a discussion of Carbo Zinc 11 with or without topcoats, as a tank lining, and as a high temperature coating. Physical properties and application advantages are included. *Carboline Co.*

Welding News 2

Number 166 is the designation given the latest Hobart Arc Welding News. Articles on welding from all over the country are included with illustrations. *Hobart Brothers Co.*

Air Cylinders 3

Industrial air cylinders are described in bulletin 115. Designed to conform with JIC standards, these cylinders are covered with line drawings, illustrated, specification information and capacity charts. The cutaway view in this 13 page brochure shows the operating parts of the units. *Ortman-Miller Machine Co.*

Bending Machine 4

Bending operations utilizing a newly developed electronic bending machine are described and illustrated in a four page folder. Principal of operation, specifications and features are covered. *Pines Engineering Co.*

Specifications 5

Precision differentials and end gears are covered in a new four page bulletin which contains charts, line drawings, specifications and engineering information. Four tables list data on precision end gears for 96, 72, 64 and 48 diametral pitch, respectively. Each table covers 28 units and the number of teeth varies over a range from 24 to 192. *Instru-Lec Corp.*

Inclinable Presses 6

Bulletin 52113 describes and illustrates inclinable presses in capacities from 40 to 200 tons. Line drawings, charts and general specification data completes the information needed for proper press selection. Illustrations of various models are shown. *Federal Machine and Welder Co.*

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Stainless Chart 7

A newly issued stainless steel machining chart provides a table of recommended machining rates for 37 different types of stainless, including the precipitation-hardening grades. Ten separate machining operations—with specific tooling data—are condensed into one quick reference chart. An easy-to-read conversion table for sfm to rpm is included. *Peter A. Frasse and Co., Inc.*

Isotope Chambers 8

A new 6 page brochure provides engineering data on 19 isotope chambers for gamma radiography. Specifications are given for eight chambers that employ iridium 192 and for 11 units using cobalt 60. Text discussed radiography procedures, features, operation and equipment construction. Exposure times and distances are given for various types of film and steel thicknesses. *Norelco Instruments, Div. of Phillips Electronics and Pharmaceutical Corp.*

Abrasives 9

A special report on pressure blasting with manufactured abrasives has been published. This report describes the areas of application for pressure blasting and the various media used. Emphasis of the report is on the proper selection and use of aluminum oxide and silicon carbide abrasive. Charts and drawings provide useful operating information and procedures for the popular types of media and equipment. *Norton Co.*

Rolled Platters 10

Various types of patterns that can be rolled on Sharon steel are discussed in a 20 page handbook with illustrations and informative text. Data on sizes, pattern designs and identification numbers are also included. *Sharon Steel Corp.*

Sleeve Bearings 11

Folder 2823 covers Flex-Block sleeve bearings and includes two new types of self aligning and self lubricating bearings in flanged and pillow block types. Features, specifications, applications, selection, dimensions and other data is shown. *Link-Belt Co.*

Sub Presses 12

Cylindrical sub-presses for precision die alignment are discussed in a new bulletin numbered 960. These units are ideal for work on carbide dies, progressive blanking and piercing, and blanking operations, form bending and numerous other applications. *Waltham Machine Works, Inc.*

Carburetion Units 13

Six pages discuss LP-gas carburetion benefits and uses in simple, concise terms. Five different topics are covered in the illustrated brochure. Briefly they are: petroleum gas as a motor fuel; carburetion systems; applications to the farming industry; applications to the trucking industries; and industrial truck uses. *Century Gas Equipment.*

Heating Units 14

The features and equipment of six models of radio frequency heating units are described in a series of bulletins, numbered 1515 through 1520. Complete specifications with illustrations are given. *Lindberg Engineering Co.*

Battery Chargers 15

Battery chargers for motorized-hand and rider-type electric truck batteries are described in a new three fold bulletin. Line drawings and graphs are included with illustrations and charts to cover the specifications for the units. *Motor Generator Corp., Hobart Brothers Affiliate.*

Roller Bearings 16

Numerous types of straight and roller type bearings are discussed in a new 15 page booklet. Company facilities for manufacturing these bearings are also covered. Cutaway views, size charts and specification data are given. *Rollway Bearing Co.*

Collets 17

Collets and collet fixtures are covered in a new 8 page booklet. Line drawings show the dimensions of the units and illustrations with specification data complete the information for the proper selection of the proper unit for a specific application. *Zagar, Inc.*

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Plating Process 18

An 8 page, illustrated booklet describing equipment, application techniques, and plating jobs performed with the Dalic Process—a method of electroplating localized areas of a workpiece quickly without using immersion tanks—has been published. Several plating applications are illustrated. *Sifco Metachemical, Inc.*

Compounds 19

A comprehensive, 12 page metal-finishing brochure, titled "Specialized Processing Compounds for the Metalworking Industry," is now available. This illustrated booklet contains specific information for the use of each of 43 products that make up the company's standard 1 ne of cleaning and processing compounds for the metalworking industry. *Turco Products, Inc.*

Wheel Forming 20

A new attachment to dress grinding wheels optically is described in a 6 page folder. Illustrations are shown to augment the specification data and line drawings which are included in the literature. *Parker-Hartford Corp.*

Metal Building 21

Six page booklet BD-2602 describes and illustrates various types of metal buildings suitable for industrial use. Specifications, types and measurements are included. *Parkersburg Rig and Reel Co.*

Rolling Diaphragms 22

Complete information is included in new literature titled "New Design Manual for Rolling Diaphragms." Line drawings and charts are given also. *Bellofram Corp.*

Solvent Cleaner 23

Description, performance, how-to-use, and features of Houghto-Clean 220 are covered in a data sheet offered by the manufacturer. The sheet reports that this high solvency, emulsion type cleaner efficiently cleans metal and protects parts from rust by a film deposited on the surface after being processed in this solution. *E. F. Houghton and Co.*

Tap Selection 24

A novel tap selection booklet simplifies tap buying. The booklet is based on a series of detailed tap-use field studies in many industries. It has been compiled to simplify the specification information of the proper tap in 75 pct of all tapping operations. A master chart lists various materials, cutting characteristics, best tap, usable tap, possible tap, lubrication, problems, and solution. In addition to this the booklet contains many other items of interest in this field. *Besly-Welles Corp.*

Die Casting Machine 25

Six pages describe and illustrate the many features of the model 400 high pressure die casting machine. Charts and close-ups show the specifications and optional equipment available with this unit. *Cleveland Automatic Machinery Corp.*

Industrial Felt 26

A ready reference index which alphabetically lists hundreds of applications of industrial felts is featured in a new catalog. In addition to information on the proper type to use there are tables listed under "roll felts" and "sheet felts" with all pertinent data given. *Continental Felt Co.*

Material Handling 27

Custom built material handling equipment is covered in a new 8 page booklet. Illustrations, charts and specification data are shown for the various types of non-motorized units. *Alfab Co., Inc.*

Tapping Alloys 28

Data sheet describes a new sulphurized base for deep hole tapping and similar operations on stringy alloys. Qualities, features and specifications are given. *Baker-Gubbins Co.*

Abrasive Wheels 29

Technical data sheet FD-30 discusses the features and applications of abrasive cloth wheels. The wheels are designed for polishing and sanding complex contoured surfaces. Various configurations and grit grades are listed. *Merit Products.*

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7-In. Grinder 30

Illustrations, specification information and catalog listings complete the data for new grinding machines. Bench models and floor models are covered in chart style in the single sheet folder. *Walker-Turner Div., Rockwell Mfg. Co.*

Abrasive Wheels 31

Two new bulletins discuss depressed center abrasive wheels and silicone carbide tool grinding wheels. Charts, line drawings and specification information are covered. *Simonds Abrasive Co.*

Tool Catalog 32

Catalog 700 illustrates and describes a complete line of tools including 330 items not previously listed. This 132 page catalog gives complete information on all categories of tools in the line. *Armstrong Bros. Tool Co.*

Air Motors 33

Catalog 660 covers a line of rotary air motors, air compressors and vacuum pumps for OEM or plant use. Illustrations, line drawings, graphs and charts are shown to accompany the specification data. *Gast Mfg. Co.*

Silicone Rubber 34

An 8 page brochure describes a silicone rubber that cures at room temperature and is recommended for flexible molds and precision reproductions. The material is available in liquid or paste types and features physical and electrical properties which are not affected by heat, cold, moisture, ozone and corona. Graphs are shown on the back cover giving the specifications of Silastic RTV. *Dow Corning Corp.*

Hydraulic Pumps 35

A comprehensive new catalog covers every requirement for a complete hydraulic installation, from pumps to accessories. Called catalog 21, it has 76 pages. 96 basic models are described and illustrated. A complete section is devoted to accessories. *Oil-Dyne, Inc.*

Zirconium 36

"The corrosion resistance of zirconium" is the title of a new 14 page publication which contains detailed graphs for over 100 highly corrosive media in concentrations up to 100 percent and temperatures up to 400 deg F. The corrosive media is listed alphabetically for quick reference. *Zirconium Association.*

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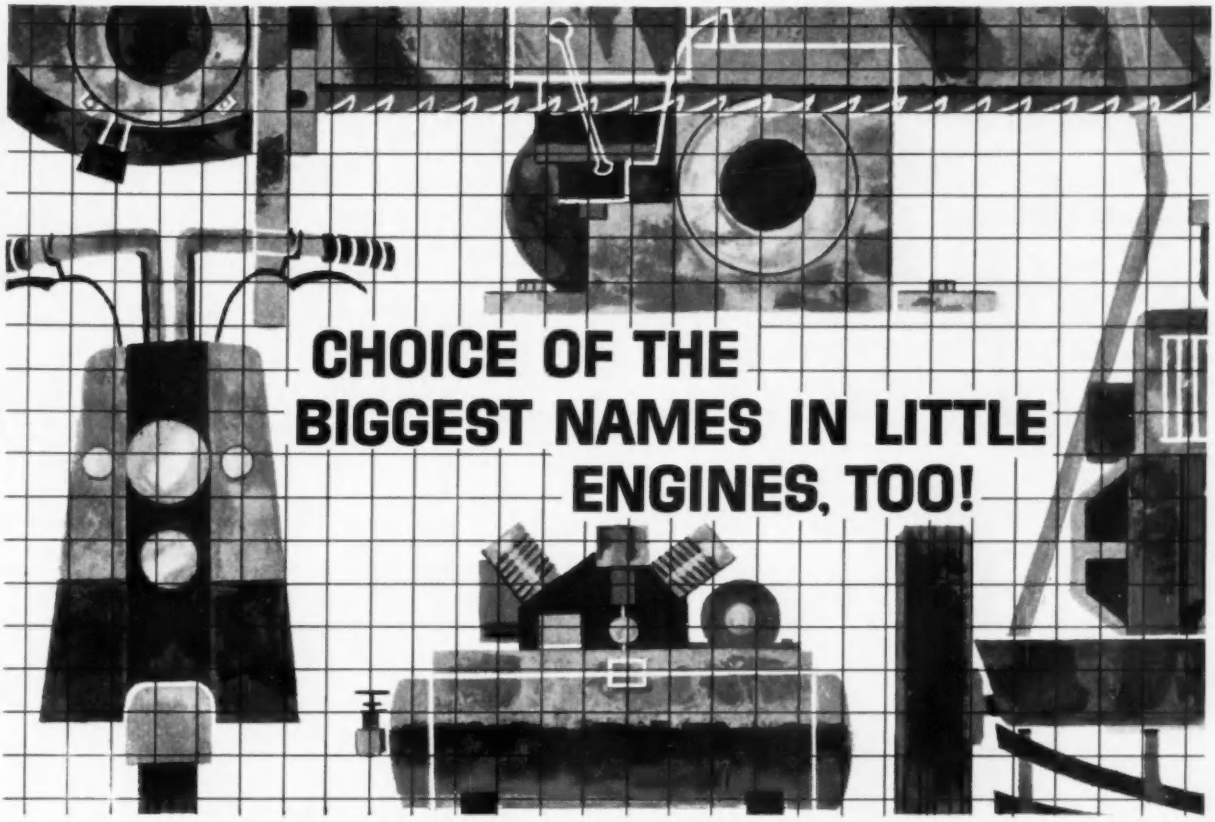

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